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DISCOVERY

A Monthly Popular Journal of Knowledge

Vol. VIII. No. 92. AUGUST, 1927. PRICE 1s. NET

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(See page 243).

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CONTENTS

	Pages.
Editorial Notes	241
The Globe Playhouse?	243
After-thoughts on the Eclipse	248
The British Association ...	250
Shakespeare's Youth	251
Correspondence	255
Costa-Rica	256
A British Chemical Romance ...	259
Bird-watching in the Shetlands	260
Cultivation of Antique Flowers	263
Shakespeare's England	265
Progress in Air Surveying ...	267
The Month's Wireless	271
Book Reviews	272

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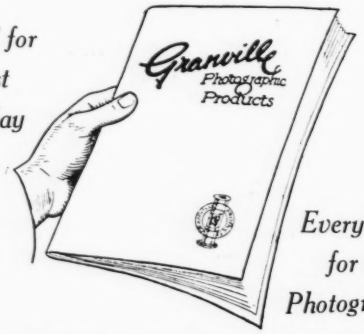

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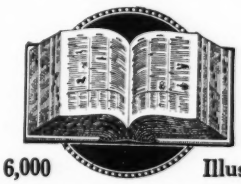

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IN the belief that there may be a substantial number of parents who are dissatisfied with the overworked ignorance of the majority of our schools, and are at the same time anxious to avoid the emotionally-determined efforts of cranks, the directors of the Malting House School, Cambridge, have decided to convert it into a partly residential school, at present for children from 4 to 9. The Malting House School, founded as a day school in October, 1924, by Cambridge parents, is a non-profit-making institution and in addition it has been fortunate enough to secure from friends of education financial support, so that it shall be run with the sole consideration of educational efficiency and progress.

The directors would be glad to hear from parents who have children of the ages mentioned whom they might care to send to the School. The fees will be £115 per annum inclusive.

The following is a statement of the assumptions on which the existence of the school is based and of the methods used there:

The body of knowledge which the changing economic and social order of the twentieth century demands, particularly from the middle-class individual, is likely to increase yet further and requires for its greatest use and greatest enjoyment the backing of an organized collection of emotional and intellectual drives. It is highly probable that these drives, usually grouped together in the term curiosity, exist in the early lives of most people, and that their striking loss in later years, rendering many born with good brains intellectually ineffective and tired of life, is due to some large extent to laming by early influences.

The most consciously held aim of the educator should therefore be to avoid damaging these drives, and, lest his life should pass in loading ships with ballast, to rank that aim *before* that of the instillation of knowledge—particularly in the early years when relatively little knowledge can be instilled and great damage can be done.

At present there is no recognized, infallible or easily-applied technique for the preservation of curiosity during education. Nevertheless the directors believe that the learning of how to learn and a scientific scrutiny of familiar things, an attitude of critical curiosity and intellectual aggression to the unknown, require to be *preceded* by the discovery of the idea of discovery.

The method employed at Cambridge with children ranging from 3 to 7 to forward this result is on the one hand to eliminate the arbitrary authority of the pedagogue and to substitute for it the attitude of the co-investigator (" Let's find out " and not on any verbal information is the answer given to most questions), and on the other hand to provide an environment with more than usual scope for activity, intellectual and social, including apparatus which shall both set problems and provide their solution. For instance : a lathe, stimulative poser of many arithmetical and geometrical questions — apparatus showing

Continued on next page

Continued from previous page

the expansion of materials under heat where nothing visible may happen except with patience—a garden with plants (which may without taboo be dug up every day to see how they are getting on, leading mainly to the discovery that that is a temptation best resisted if growth is desired)—animals which breed—weighing machines graded from a see-saw with weights, through kitchen scales, to a laboratory balance—typewriters to bridge the gap between writing and reading—double-handled saws which compel co-operation—and clay for modelling, where phantasy pays toll to skill and effort.

Complementary to, but always lagging behind this, is the attitude more and more implied for the child that "Life is too short for you to discover all that the human race has discovered before you" (this is a fact that we cannot wait for a child to discover) " and now I am going to teach you. And the things I am going to teach you were discovered in the same *kind* of way as yesterday you discovered that sand would not burn on a bonfire, that water is composed of those two gases you combined, and that some people, like Miss So-and-So, believe in fairies and that some do not."

The Cambridge work—admittedly limited and in a school consciously designed for children who are above the normal—goes to show that the demand for information and the receptivity to ordinary instruction is by these methods at least not lessened.

The environment may need altering. The directors claim no fixity for it. As the children grow to University age (to which it is hoped to carry them) it will constantly need adding to. But it is to make these alterations with security that they—and other schools—need the help of central research institutes drawing in the work of investigators in correlated subjects and attached to the schools, local departments, continuously recording, testing and, it is to be hoped, influencing the work done with each child. For we need to discover no less how to reduce the psychological cost of attaining our present standards of education, than how to produce more highly educated people.

★ ★ ★

Private enquiry having failed to produce the candidate required, the directors have recently issued on a widespread scale an advertisement of their need for an all-round scientist—if necessary of senior standing—to investigate and conduct the introduction of children to scientific thought and method.

The object of the directors in advertising so widely has been to obtain the attention of a large number of scientists—not necessarily pedagogues—and therefore as large a range of applications as possible from which to make a selection. They hope also, by stating publicly their view of a problem which has not yet received sufficient attention, to precipitate the attention and agreement, disagreement or co-operation of all those—scientists, parents, educationists or members of the general public—who are interested in its solution.

*While visitors to the school are welcomed, it may be mentioned that a week's activities of the children have been filmed (the children being " stalked " whilst engaged in their everyday occupations). A private view of the film is shortly to be given in London, probably on a Sunday afternoon. Those who would like to see it are asked to send their names and addresses to the Directors, the Malting House, Cambridge, and a formal invitation will in due course be sent to them.

DISCOVERY

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Editorial Notes.

At the Oxford conference with which this issue coincides, there are few aspects of the life and work of Shakespeare that will escape discussion. In the course of the three week's programme, outlined on page 265, a unique survey is to be afforded, but our intention in publishing a "Shakespeare Number" this month is no less to offer some additional problems for the study of those now in Oxford, than to focus interest in the conference among the larger public elsewhere. Many readers who are lovers of London will be acquainted with the controversy that has raged for some years over the site of the Globe playhouse, and this is now carried to what may well prove to be the final stage in the article we publish by Mr. George Hubbard. Having so long ago as 1913 obtained the agreement of the then Clerk to the County Council, the late Sir Laurence Gomme, with his contention that the Shakespeare Reading Society was mistaken in its choice of the site of this theatre, our author was confronted, on raising the matter again after the war, by new officials who took the contrary view. Indeed, some pamphlets were issued on behalf of the Council supporting the Society that the south side of Maiden Lane, now called Park Street, in Southwark, had been correctly commemorated, and not the north side which Mr. Hubbard contends was the actual site. We hope to follow the present contribution with some further evidence that has not hitherto been brought to light; without overstressing the significance of this particular controversy, we consider it of the utmost importance that such historical problems should not be regarded as finally settled until the fullest publicity has been given to all the relative facts. This also applies to another article in this number, by the Master of Jesus College, Cambridge, whose new theory of Shakespeare's youth has undoubtedly encountered prejudiced criticism in certain quarters.

* * * * *

It is now computed that in England alone no fewer than three million people watched the eclipse. Looking back on an event which aroused such unprecedented interest, it is surprising to be reminded by Dr. Crommelin's review on another page that, so late as March, one of the principal railway companies issued a circular that they proposed to run a special train to the north for the 29th June "if sufficient applications were forthcoming"! Actually about a hundred excursion trains were run, while thousands travelled by road. Our contributor states that this widespread popular interest was most gratifying to astronomers, but we may remark that it was equally a tribute to the lucid information which they had not spared themselves to make everywhere available for the public. Few have done more in this direction than Dr. Crommelin, who was just retired from the Royal Observatory at Greenwich; and we are pleased to announce that in future he will write on astronomical matters regularly in *Discovery* each month.

* * * * *

Not everyone who went specially north for the eclipse will have had the good fortune to choose Southport as their station. Perhaps it was that there, though the view obtained was only second to that at Giggleswick, a slight haze obscured the brightness of the corona, but to us the effects on the ground were not one bit less pleasing than those in the heavens. Nothing, of course, could surpass the thrill experienced when the circle of light suddenly appeared, and was as quickly again swallowed in the brilliant burst of light as the moon's shadow passed by; but

we have never seen a sunset whose colours left such a striking impression as the remarkable changes experienced immediately before total eclipse. The early morning green of the fields faded through deepening shades to a dark blue-black, while ahead of us, as the corona stood out as it were intervening in the deep grey sky, a large bank of orange-red clouds were seen on the horizon. Away to the right, the clouds were a beautiful purple and then—a final glance at the corona—the sun burst forth again in a flash. Dr. Crommelin remarks on the common experience that the return of light is apparently more rapid than the period of fading immediately before totality, and while this is partly accounted for by the more sensitive condition of the eyes after the darkness, he says this presents a problem which cannot entirely be explained by this cause.

* * * * *

During the week prior to 4th August the nineteenth Universal Congress of Esperanto takes place in Danzig, ending with a pilgrimage to Warsaw to visit the tomb of Dr. Zamenhof, the author of the language. For this purpose the Polish Government are extending free visa courtesies to the delegates, who are expected to number between two and four thousand, including a fair representation from Britain. Various bodies are sending official representatives, among whom the High Commissioner of the League of Nations is expected to attend. The use of international language among research workers was advocated recently in *Discovery*, by an author who had procured information from Russia through this means, and it is interesting to note that during the present conference lectures on scientific subjects of international interest will be delivered in Esperanto by university professors from several countries. A picturesque ceremony will be the naming of an Esperanto street and square in Danzig, during which Esperantists from all over the world will contribute a handful of their native soil in the planting of a commemorative oak.

* * * * *

We commented last month on the contention of a recent American contributor that there are in England many documents of great historical interest awaiting to be discovered, which are often hidden away in the libraries of country houses or in the hands of persons who are unaware of their value to the student. Since then an instance has been made public in *The Times*, though we shall refrain from expressing an opinion on its importance as compared with that of the manuscripts for which Mr. Allen French was seeking. It appears that the object of many American literary collectors is to form a complete set of what are known as "The Signers," and these must consist of original papers or autograph signatures —not facsimiles—of each of the fifty-six men who signed the Declaration of Independence. Some are common enough, but two which are very rare include those of Button Gwinnett, who died in 1777. A recent monograph on the subject showed that nine of his autographs were known to exist apart from those in the complete collections, and its author suggested that there "may be many yet lurking in various archives in and around Bristol and Wolverhampton."

* * * * *

So far at least as Wolverhampton is concerned this suggestion has now had a remarkable and almost romantic sequel. When searching the records of the Wolverhampton Blue Coat Charity School for the purpose of writing a history of the town, Mr. Gerald Mander examined a folio volume of the minutes of the school extending from 1716 onwards. Within the compass of a few pages he discovered no fewer than three beautiful signatures of Button Gwinnett in the minutes respectively of 6th August, 5th November, and 3rd December, 1761, which concerned ordinary incidents in the events of the school, signed in one column by Trustees and in the other by Subscribers; and it is among the latter that Button Gwinnett appears. These have now been sold to a New York bookseller and the proceeds will go to the school.

* * * * *

The tours in old London arranged for readers by the publishers of *Discovery* have met with unqualified success, if we may judge from the many appreciative letters received from those who have so far taken advantage of our invitation. Leaving Bouverie House at 2.45 p.m., the party is conducted through some historical section of the City by Mr. Allen Walker, whose knowledge of the antiquities of London is well-known through his broadcast talks. On most afternoons interest is centred on the famous literary characters with which Fleet Street is associated. Further tours are arranged for the following dates.—

Aug.	3rd	Central Criminal Courts; Christ Church, Greyfriars.
,,	9th	St. John's Priory Church, St. John's Gate, Headquarters of the Crusading Order of the Knights of St. John of Jerusalem.
Sept.	7th	St. Paul's Cathedral.
,,	13th	St. Martin's, Ludgate; Remains of London Wall; Stationers' Hall.
,,	21st	St. Andrew-by-the-Wardrobe; Playhouse Yard (site of Shakespeare's Southwark Theatre); The Apothecaries' Hall.
,,	27th	"Dickensland": Staple Inn; Furnival's Inn; Old Houses on Holborn; St. Sepulchre's, Snow Hill.

Tickets (free of charge) may be obtained in advance on application to the editor.

Where *was* the Globe Playhouse?

By George Hubbard, F.S.A.

As the result of a controversy which the author raised over the site selected as that of the Globe Playhouse of Shakespeare, a booklet has lately been issued on behalf of the London County Council in answer to his challenge. In a further examination of the problem, Mr. Hubbard replies by advancing evidence which it is believed should finally settle the dispute. Will the memorial tablet now be moved?

It was not until the last quarter of the sixteenth century that theatres were erected in this country, and perhaps the first to make its appearance was a building called "The Theatre."

A very full account of this is given in Halliwell Phillip's "Outlines of the life of Shakespeare,"* from which it appears that a certain James Burbage obtained a lease dated 13th April, 1576, for twenty-one years from Giles Allen of "houses and land situated between Finsbury Field and the public road from Bishopsgate to Shoreditch Church." On this piece of land James Burbage built "The Theatre," and his sons stated that their father "was the first builder of playhouses."† James Burbage died in 1597 leaving two sons, Cuthbert and Richard, and it was in the spring of that year that the term of twenty-one years in James Burbage's lease from Allen ran out; but the brothers Burbage were allowed to continue as tenants after the death of their father. In December, 1598 or January, 1599, the brothers engaged the services of Peter Street, a builder and carpenter, to remove the timber of "The Theatre" to the Bankside, Southwark, where they secured a lease of two pieces of land divided from each other by a way or lane. The owner of the land on Bankside was Nicholas Brand, and he granted the lease from 25th December, 1598, for thirty-one years to Cuthbert and Richard Burbage, William Shakespeare, and others. On one of these two pieces of land the Globe was built.

Twice Destroyed.

The Globe Theatre was burnt down on St. Peter's Day, 29th June, 1613, but it was immediately rebuilt on the same site. This second Globe Theatre was pulled down on 15th April, 1644.

Such are the bare salient facts in connexion with these two Globe Theatres in which Shakespeare was part owner.

The site upon which these famous theatres stood has been a subject of controversy for generations; but all are agreed that the theatre was erected in Southwark. There is, however, a difference of opinion as to whether the theatre stood on the north or south side of a lane formerly known as "Maiden Lane" and now known as Park Street, Southwark. The solution of this vexed question cannot be a matter of vast importance, and perhaps it has gained an undue prominence from the fact that the Shakespeare Reading Society in October, 1909, erected on the south side of Park Street a large bronze memorial (Fig. 2) to commemorate the site. In this memorial there is a panel which purports to represent the Globe Playhouse, set in the midst of its former surroundings. Dr. William Martin's name appears on this memorial as the designer of the panel. The Globe stands prominently in the foreground on the south side of Maiden Lane. In other respects the panel is a good copy of Norden's map of London of 1593 (Fig. 1), a map that was made *before* the theatre was erected.

Contemporary Maps.

There are, however, in existence at least six contemporary map views in which the Globe appears, and in order that there should be no uncertainty about the identification of the theatre the words "The Globe" are inscribed above the theatre, or in the absence of these words there is an index number which on reference is found to be "The Globe." In each instance the Globe is shown as standing on the north side of Maiden Lane, and not on the south side as in the memorial. In none of the map views is there any building which can be identified as the Globe on the south side of Maiden Lane. The six map views showing the Globe on the north side of Maiden Lane, and naming it, or bearing a reference number for its identification, are as follows:—Visscher's view, 1616; Merian's view, 1638; Vanden Hoeye's view of about the same date; *Le Profil de la Ville de Londre* by Boisseau; Hollar's view published in 1647; and F. de Wit's view of about the same date.

No doubt in some cases there has been the tendency for one cartographer to copy the view of a previous artist; but if that famous Playhouse had stood on the south side of Maiden Lane it is not likely that every artist should have made the mistake of placing the theatre on the north side. In some of these views, including Visscher's, Maiden Lane is not shown.

* 1907 Ed., Vol. I, p. 346. † *Ibid*, p. 317.

It lies too far south to be included. All that does appear, the Globe included, lies on the north side of Maiden Lane.

Dr. Martin in his pamphlet, "The Site of the Globe Playhouse of Shakespeare," disposes of the evidence of these map views by suggesting that they are wrong. With regard to Merian's map view (*c.* 1640) the Globe is clearly shown on the north side of Maiden Lane and it has a reference number 37, which in the index is stated to be "The Globe." Dr. Martin considers that there has been a mistake and that the reference number 37 should have referred to the Rose, and the building which he considers should be called The Globe has been called the Bear Garden. After having styled the buildings in this arbitrary manner, he says, "We see The Globe assigned to a position south of Maid Lane!"

Hollar was perhaps the greatest and most reliable cartographer, and he shows the Globe, as Dr. Martin points out, "prominently upon the Surrey bank of the river." Dr. Martin's comment on this is that "the draughtsman had no local knowledge. It would seem that he filled up an unplotted area from memory which was faulty."

With regard to Visscher's view the Globe is shown, and the words "The Globe" stand above the building. Dr. Martin admits that this prominent building is shown on the north side of Maid Lane, but he adds "It is far from clear, however, that the polygonal building thus styled, which was evidently some form of playhouse or amphitheatre, was in fact the Globe," and he goes on to suggest that the panoramic view may have been cut down and that in consequence the Globe was cut out, so that the words "The Globe" might refer to a drawing of the Globe which is omitted. The words "The Globe" have obvious reference to the building immediately below it.

In 1913 I called the attention of the London County Council to what appeared to me to be an error of judgment in placing the memorial on the south side of Maiden Lane. At that time the great topographical scholar, Sir Laurence Gomme, was Clerk of the Council, and I think that it is worth while quoting a letter I had from him dated 5th June, 1914, in which he says:—

"It became apparent that your contention as far as it related to the position of the theatre in regard to Maiden Lane was correct and the Globe was situated on the north side of that thoroughfare . . . and the Committee of the Council to whom I have made a full report are in perfect accord with that view. By their instructions I am communicating with the proper authorities suggesting that the present tablet (erected by the Shakespeare Reading Society) should be removed and a new tablet erected recording the fact that the theatre was to the north of the present Park Street."

Then came the war, and Sir Laurence Gomme's retirement and death.

I again brought the matter before the Council in 1921, and in that year the Council published a pamphlet, "The Site of the Globe Playhouse Southwark," under the authorship of Mr. W. W. Braine, a principal assistant at the L.C.C., in which he supported the theory that the theatre stood on the south side of Maiden Lane. In 1923 I published a book entitled "On the Site of the Globe Playhouse of Shakespeare," in which I attempted to confute the arguments advanced by Mr. Braine. In the following year, on behalf of the L.C.C., Mr. Braine published a further book entitled "The Site of the Globe Playhouse Southwark," which was intended to be a reply to my book.

Within the limits of the present article it is impossible to do more than to refer shortly to one or two of Mr. Braine's points bearing upon the

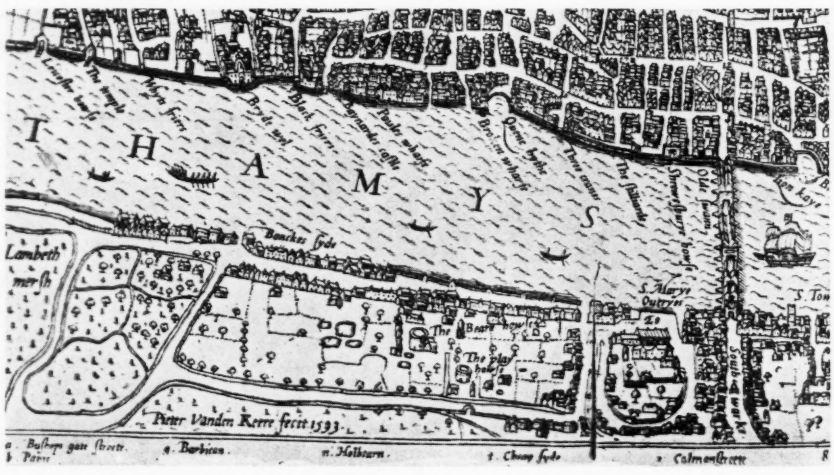


FIG. 1.
NORDEN'S MAP OF LONDON, 1593, FOR COMPARISON WITH THE TABLET OPPOSITE

This is one of the map views in which the site of the playhouse appears named or otherwise marked. It is clearly seen above to the north of Maiden Lane, which runs east and west immediately below it. Notwithstanding this the memorial tablet has been erected on the south side of the road.

documentary evidence ; and while in no way intended as an adequate reply to his elaborate arguments and deductions, it is, however, hoped that the contemporary documents may be taken at their face value and that they are intended to mean what they say. Otherwise arguments, however able, must remain unconvincing.

The most important and convincing contemporary document was discovered by Dr. Charles William Wallace in the Coram Rege Roll* dated 1616. This document was published in *The Times* of 2nd and 4th October, 1909, and in my opinion it should have, once and for always, settled the question. The document has reference to a family difference which led to a law suit. The complainant is Thomasina Osteler, a nineteen-year-old widow. She was a daughter of John Hemyngs, a close friend of Shakespeare and one of the co-editors with Henry Condell of the famous 1623 folio of Shakespeare's works. For Thomasina to make out her case and establish her legal rights, her attorney found it necessary to recount from legal documents, then extant, the history of the shares she claimed in the Globe and Blackfriars Theatres. Although this case is directed against her father John Hemyngs, it is in effect against Shakespeare, the two Burbages, and the whole company of shareholders.

[*Photo by Donald Macbeth, London.*

FIG. 2.

THE GLOBE MEMORIAL TABLET: IS ITS POSITION CORRECT?

Except that the Globe Playhouse is represented south of Maiden Lane, this tablet is a good copy of Norden's map. It was erected on the south so long ago as 1909 by the Shakespeare Reading Society, but evidence advanced by the author suggests that its position should now be moved.

This document recounts the boundaries of the land as they are described in the original lease. It is in fact a copy of the lease granted by Nicholas Brand to the brothers Burbage, William Shakespeare, John Hemyngs, Augustas Phillips, Thomas Pope and William Kemp. It is only necessary to quote extracts from this document which bear on the question of the position of the site of the theatre. From the lease transcript it appears :—

"That whereas one Nicholas Brend of West Moulsey in the County of Surrey Esquire . . . demised, . . . to certain individuals, Cuthbert Burbage and Richard Burbage, William Shakespeare, Augustus Phillips, Thomas Pope, John Hemyngs and William Kemp . . . . . all that parcel of land lately heretofore inclosed and made into four several yards . . . containing in length from East to West two hundred and twenty feet of assize or thereabouts lying and adjoining upon a way or lane there on one side, and abutting upon a piece of land called the Park upon the North and upon a yard then or late in the tenure or occupation of one John Cornish towards the West, and upon another yard then or late in the tenure or occupation of one John Knowles towards the East. . . . .

"And also all that parcel of land . . . containing in length from East to the West by estimation one hundred and fifty and six feet of assize or thereabouts, lying and adjoining upon the other side of the Way or lane aforesaid, and abutting upon a yard there, then or late heretofore in the occupation of William Sellers towards the East, and upon another yard there, then or late heretofore in the tenure of John Burgram, Sadler, towards the West, and upon a lane there called Maiden Lane towards the South . . .

"Upon which same premises or upon some part thereof, existed a certain playhouse fit for showing or acting of Comedies and tragedies."

The chief points to bear in mind in this lease transcript are that one of the pieces of land abutted upon a piece of land called the Park upon the north, the other piece of land abutted upon a lane called Maiden Lane towards the south. Reference will be made later to William Sellers who adjoins the Globe property on the east. It will be observed that a "way or lane" divided these two pieces of land. I well remember some twenty-five years ago noticing that there was an unused passage-way some ten feet wide which ran between the backs of the warehouses fronting

* 1454. 13. Jas Hil m. 692.

upon Bankside and the backs of the warehouses fronting upon Park Street. It is, I believe, a fact that neither the freeholders of the land fronting upon Bankside, nor the freeholders in Park Street have any titles to this passage-way between the two properties. Encroachments have been made upon it in later years, so it is not as distinct as it was when I saw it so many years ago.

The difference of opinion as to the position of the site of the Globe arises from the fact that the only park recognized by Dr. Martin and Mr. Braines is the great park of the Lord Bishop of Winchester which lay to the south of Maiden Lane. They therefore consider it could not have formed the northern boundary of the land leased by Brand to Cuthbert and Richard Burbage, Shakespeare, and others. Mr. Braines has come to the conclusion that "the description of the site contained in the lease transcript is indubitably wrong." Dr. Martin affirms that "no evidence is yet forthcoming that the park ever lay to the north of Maid Lane," and he concludes that the draughtsman of the document had been careless as regards the bearings of the area which he was describing. If the cardinal points are reversed in this lease transcript, as is assumed by Dr. Martin and Mr. Braines, then they must have been reversed in the original lease granted by Nicholas Brend on the 21st February, 1599, to the Lessees Cuthbert and Richard Burbage, William Shakespeare, and others.

A Topsy-turvy Argument.

All these men must have signed the original lease, and it is preposterous and unbelievable to suppose that none of them observed that all the cardinal points were reversed. This topsy-turvy argument is founded upon the theory that in this lease transcript the land is said to be "abutting upon a piece of land called the Park upon the north."

There is no doubt that in the twelfth century the park did extend northward and went right down to the river. Mrs. Stopes, who is a great authority on Shakespearian matters, has called my attention to MacKenzie Walcott's account of William of Wyckham and his colleges in which he says :—

"Winchester House in Southwark was built by William Gifford, Bishop of Winchester in 1106 . . . on the South were a park and gardens on the North flowed the Thames under a noble terrace. On the East was the Priory and on the West Paris Gardens."

Here is clear evidence that at one period the Bishop's Park did extend northwards as far as the river, and it is probable that a portion of this park continued to be known as the Park after developments had taken place upon it.

There is yet another piece of evidence that bears upon the question of a park other than the Lord Bishop of Winchester Park. An account of this I forwarded to *The Times* on 3rd December, 1921.

In Southwark Cathedral there is a large bundle of manuscripts giving the names and addresses of the inhabitants in the Liberties of Southwark. These documents are known as the Sacramental Token Books, and their primary object was to keep the records of those who took the sacrament, and those who failed to do so. Those who failed to take the sacrament became thereby liable to punishment, and even death for those who were preternaturally obstinate. In the Sacramental Token Book for the Liberty of Bankside for the year 1609, that is, during the life of the first Globe Theatre, the name of Hughe Robinson is recorded under the sub-heading "Fro the Park." I have been fortunate enough to light again upon Hughe Robinson "Fro the Park."

In Collier's Memoirs of Edward Allen there is reference to a paper stated to be now at Dulwich College, but which formerly belonged to Edward Allyn and afterwards passed to Malone. This document contains the names of the inhabitants of the Liberty of the Clink "wch are rated and assed to a weekeley paimt towards the relief of the poore as it stands now increased this 6th day of April 1609." Hughe Robinson's name appears in the list of those who paid a poor rate. He was rated at twopence per week for half the park and a man named Stock also paid twopence per week for half the park. Thus the total poor rate upon this park only amounted to fourpence per week. This small rating could hardly have applied to the great park of the Lord Bishop of Winchester which covered some sixty acres and was by far the largest holding in the district.

This small park which lay partly in the Liberty of the Clink and partly in the Liberty of Bankside did in all probability lie on the north side of Maiden Lane, for the south side was occupied by the Lord Bishop of Winchester's Park. It may well be that this small park was the park referred to in the lease transcript, wherein it is stated that the property "abutted upon a piece of land called the Park on the North."

Perhaps more conclusive evidence that the Globe stood on the north side of Maiden Lane may be gathered from some entries in the Minute Book of the Sewers Commissioners, and in this connexion it is interesting to note what Strype has to say in his edition of Stow's Survey, 1720 :—

"Maiden Lane, a long straggling place with ditches each side, the passage to the houses being built over little bridges, with little garden plots before them, especially on the North side which is best for houses and inhabitants."

Particular attention should be given to these ditches as they play an important part in determining the site of the Globe Theatre.

Maiden Lane ran east and west and on either side there was a ditch, one on the north side of the road and one on the south (see plan, Fig. 3). These ditches or sewers were under the control of the Sewers Commissioners, and it was the duty of that body to take the necessary action in calling upon the occupiers of the adjacent land to clear out any obstruction to the free current of water along them. Thus the occupiers of land on the northern side of the road would be responsible for the maintenance of the northern sewer opposite their property, and the occupiers of the land on the south side would be liable for the southern sewer. In this low-lying, water-logged, locality it was essential to maintain this drainage system in working order.

On 14th February, 1605, the Sewers Commission made the following order :—

> " It is ordered that Burbage and Hemings and the other owners of the Playhouse called the Globe in Maiden Lane shall . . . pull up and take and cleane out of the sewers the props and posts which stand under theire bridge on the North side of Mayd Lane."

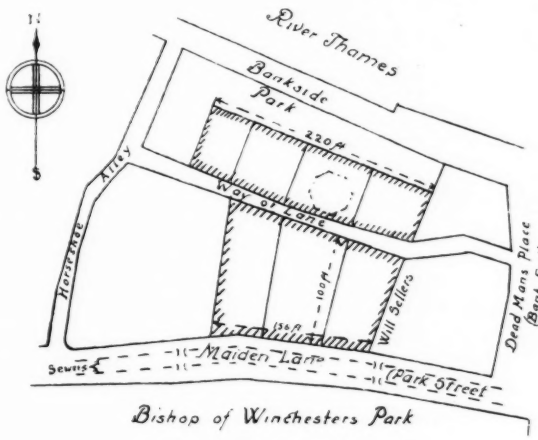


FIG. 3.
RECONSTRUCTED PLAN OF BANKSIDE, SOUTHWARK, IN 1600.
Sewers which ran on the north and south sides of Maiden Lane in Shakespeare's day, mentioned by a Sewers Commission in 1605, throw light on the position of the Globe Playhouse.

What could be clearer? Here is a contemporary and official document calling upon the owners of the Globe to remove the obstruction under *their* bridge on the *north* side of Maiden Lane. If, as the L.C.C. and the Shakespeare Reading Society maintain, that the Globe was on the south side of Maiden Lane, then it is difficult to see why the owners of the Globe Playhouse were called upon to do the repairs to *their bridge on the north side of the road.*

On 5th December, 1595, that is four years before the lease was granted by Nicholas Brend to the brothers Burbage, Shakespeare, and others, the Sewer Commissioners ordered John Warden and William Sellers " and all the landholders or their tenants that holde anie landes, gardeins, ground or tenements abutting upon the common sewer leading from Sellars Gardein to the Beare Gardein to cast clense and scoure," etc.

It may be remembered that from the document discovered by Dr. Charles William Wallace in the Coram Rege Roll, wherein the boundaries of the Globe site are detailed, it appears that part of the adjoining property was " recently or just before in the occupation of William Sellers towards the east." Now it appears that William Sellers, with others, are called upon to do repairs between Seller's garden and the bear garden. It is not disputed that the bear garden was on the north side of Maiden Lane, and, if so, then Sellers must have been on the north side, for both drained into the same sewer, which lay between the two properties. If Sellers was on the north side of Maiden Lane, then the Globe must have been on the north side, for Sellers occupied the land adjoining the Globe on the east.

The evidence contained in these two minutes of the Sewers Commissioners do in themselves constitute very strong if not undeniable evidence in favour of the Globe being on the north side of Maiden Lane. Mr. Braines, however, says, " These items taken by themselves are insufficient to prove that the Globe was on the north side of Maiden Lane. Sellers," he says, " may quite conceivably have had two gardens one on each side of the road." Of course, this is conceivable, but in the absence of any supporting evidence it cannot be considered as convincing.

The second Globe must have been a fine building. Ben Jonson in " An Execration of Vulcan," says :—

> " The Globe the glory of the Bank.
> Which, though it were the fort of the whole parish,
> Flank'd with a ditch, and forced out of a marish."

Now Ben Jonson was a precisian in language, and he knew what he was talking about.

The chief patrons of the theatres probably came from the north side of the river, and the natural place for the theatre would have been on the Bankside in the midst of the pleasure resorts. Here it could easily be approached from the landing steps. On the other hand, if it stood on the south side of Maiden Lane the patrons would have gone along that long straggling place with a ditch or open sewer on either side. Here the theatre would not have conveyed the idea of a great object, seen from afar " and gloriously seen on the Bank."

After-thoughts on the Total Eclipse.

By A. C. D. Crommelin, D.Sc., F.R.A.S.

Late of the Royal Observatory, Greenwich.

The following review concludes the articles we have published about the total solar eclipse of 29th June, which was described in a preliminary way by Dr. Lockyer last February, and, nearer the event, by Dr. Carroll in our May issue. Dr. Crommelin will in future regularly contribute the monthly astronomical notes to "Discovery."

On the average there is a total solar eclipse in the British Isles (including the Shetlands) once in fifty-three years. But their distribution is far from uniform, and we have the misfortune to have struck a particularly barren patch, the blank interval from 1724 to 1927 being the longest in the whole period, past and future, for which accurate calculations are available.

The First Prediction.

The first person to note that the 1927 eclipse would be total in Great Britain was Rev. S. J. Johnson, who gave particulars about it in his book "Eclipses, past and future" published in 1874. Before that date Dr. Hind, who was then Superintendent of the Nautical Almanac, had given details of several future eclipses, including that of 1954, total just north of the Shetlands, and 1999, total at the Lizard; but he overlooked that of 1927.

In 1887 Oppolzer's wonderful "Canon of Eclipses" was published, which gave details of all the eclipses both of sun and moon, visible anywhere in the world, from 1207 B.C. to A.D. 2162. This work stimulated interest in the subject, and led to further examination of the eclipses of antiquity. It is now generally agreed that these indicate a slight apparent acceleration in the motion both of sun and moon, supposed to be really due to a slackening of the earth's rotation produced by tidal friction. This is so small that about 100,000 years will be required to lengthen the day by a second. It is an illustration of the value of total eclipses that even the rough observations of them made by the ancient observers enable this minute effect to be detected. To avoid confusion it should be noted that there is another acceleration of the moon, of rather larger amount, that is produced by planetary action, making the earth's orbit more circular. This latter action will be reversed in direction in some thousands of years, whereas that due to tidal friction is always in the same direction. Eclipses still give a most valuable means of improving our knowledge of the moon's motion, by accurate observation of the times of beginning and end of totality, and of the boundaries of the totality zone.

The time observations on 29th June were greatly facilitated by the distribution of wireless signals from Greenwich through the British Broadcasting Corporation. The thanks of astronomers are due to the Astronomer Royal, to Mr. Bowyer who is in charge of the Time Department at Greenwich, to Mr. Hope Jones who undertook the naming of every fifth second from 5h. 22m. to 5h. 26m. Greenwich Mean Time, and to Mr. Hepburn, who was one of the first to see the advantages of such a time-distribution, and took a large part in making the arrangements. There were two different predictions of the times of contact. The first was based on the eclipse elements given in the Nautical Almanac; these used Newcomb's Tables for the sun, and applied a correction of about +7 sec. in longitude to Brown's Tables of the moon. The second was due to Dr. L. J. Comrie, and applied further corrections to the places of both sun and moon, deduced from recent Greenwich observations; it made the times of contact about five seconds later than the first system. The actual observed times seem to be intermediate between the two, being three seconds earlier than the second system; but further discussion is needed before a definitive result can be given.

Three Million Spectators.

The great popular interest that was shown in the eclipse is a source of gratification to astronomers. Last March the North-Eastern Railway Company issued a leaflet suggesting a special train to Richmond (Yorks.) provided that sufficient names were forthcoming. Actually, I believe, something like one hundred special trains ran to various points in the track of totality, and the total number of spectators who came to the track in one way or another was estimated as three millions, or one-twelfth of the entire population of England. It is interesting to speculate what the congestion will be in 1999, when totality is limited to a few square miles round the Lizard.

It was realized in advance, from considering average weather statistics, that the chances were three to one

against any particular station having a clear view of the corona. Since the present summer has had more than the average amount of cloud, it must be considered fortunate that Southport, the Mecca of the majority of eclipse pilgrims, and Giggleswick, the site of the Greenwich Observatory camp, and the goal of about 100,000 observers, both enjoyed a nearly perfect view of totality. Wales fared the worst, the whole phenomenon being veiled by a thick mantle of cloud, accompanied by heavy rain. But even here the advent of totality was impressive and solemn; indeed, one is pretty safe in saying that it is certain to be worth while to undertake a moderate journey in order to reach the zone of totality. The rapidity of the descent of darkness and of the return of light, the unusual aspect of the landscape which appears to be veiled by a mantle of bluish purple, and the rapid passage of the moon's shadow, plainly discernible on the cloud-layer overhead, all combine to place one *en rapport* with the mysterious forces and tremendous velocities that prevail in the celestial spaces.

I was myself stationed at Colwyn Bay, and found it quite possible to time the end of totality within a second or so, by the passage of the edge of the moon's shadow over the known place of the sun. The return of light, which was at first of a beautiful golden yellow colour, appeared much more rapid than the descent of darkness. This effect has been noticed at other eclipses, and is partly to be explained by the greater sensitiveness of the eye after the darkness of totality; but photographic tests by the late Rev. J. Bacon seem to show that it cannot all be explained in this way.

Observations at Giggleswick.

The most important scientific results of the eclipse are to be looked for from Giggleswick, as this region seems to have enjoyed a clearer sky than any other in the British portion of the track; also photographs were taken there on a larger scale than elsewhere. In particular a lens with focal length forty-five feet was used for obtaining a large-scale photograph of the corona, the image of the moon being five inches in diameter; a plate was exposed for almost the whole duration of totality by Dr. J. Jackson, and gives a very fine picture of the inner corona and prominences, minute structural detail being traceable. A print from this photograph was sent to London by aeroplane, and reproduced in the *Evening News* on the same day, which is a highly creditable journalistic achievement.

A large-scale spectrograph was also used by the Greenwich expedition for obtaining photographs of the spectrum of the chromosphere and corona. Special attention was paid to the red end of the spectrum, since this is less well known than the violet end, and the sun's low altitude was less of a hindrance for the longer waves. Special dyes were used on the plates to render them more sensitive to this region, a procedure that had also been followed in Sumatra in the eclipse of January, 1926, but in that case the high temperature caused difficulties and prevented success. It is interesting to note that a concave mirror of speculum metal, made by Sir W. Herschel more than a century ago, was utilized at Giggleswick for focussing the light from the coelostat upon the slit of the spectrograph. This, with some other mirrors, was sealed up and placed behind a staircase in the cottage at Slough; they were unearthed a few months ago by Dr. W. H. Steavenson, and found to be in perfect condition, the sealing having protected them from tarnish.

Brilliant Inner Corona.

Dr. Steavenson was himself at Giggleswick and obtained small-scale photographs of the flash spectrum at both the beginning and the end of totality. He also observed the corona visually with a 3-inch Merz telescope having a field of view 3 degrees 10 minutes in diameter. The corona was of "sunspot maximum" type, there being four principal rays arranged fairly symmetrically round the disc. They could be traced to fully thirty minutes from the limb, probably more. Dr. Steavenson was struck by the extreme brilliance of the inner corona, which certainly greatly exceeded the full moon; he was able to hold it in view in the telescope for three minutes five seconds after the end of totality; so that observers in any part of the British Isles might have seen it, had the sky been as clear as at Giggleswick. Photometric measures at other eclipses have indicated that the total light from the corona was only one-half or one-third of that from the full moon, so that it was perhaps brighter than usual on this occasion; but it is only the inner region that is so bright, the outer portions are much fainter. Tolerable photographic results were also obtained at Southport by Prof. Turner and Dr. Knox-Shaw; the sky, however, was less clear than at Giggleswick. A simple apparatus was used for measuring the polarization of the coronal light. Inclined plates of plate-glass, blackened at the back, were inserted in two cameras, polarizing the light in two directions at right angles. While the actual results were somewhat vitiated by thin clouds, they were sufficient to show that this simple method would be quite effective under better weather conditions.

Aeroplanes were first employed for eclipse observations in the United States in January, 1925.

Air Photographs.

They were again employed on this occasion, and proved very useful, in view of the widespread cloud below. One, provided by the *Daily Mail* and piloted by Capt. Barnard, took up Messrs. Greaves and Witchell of Greenwich Observatory, and Mr. Hargreaves, the Director of the photographic section of the British Astronomical Association, by whose advice hypersensitized panchromatic plates were used. The aeroplane rose above the lower cloud layer, and the pilot skilfully steered it to an opening in the higher clouds. Three photographs were obtained, which show a considerable extent of corona. Dr. G. Merton and Mr. P. H. Hepburn also observed the eclipse from an aeroplane; both parties noted the great darkness of the sky during totality, and record the fact that the prominences appeared white to them, while observers on the ground described them as red or pink. There are several ways of accounting for this: the light of the prominences is of various wave-lengths, and the short waves would be less absorbed in the upper air, and so would have more influence on the resulting image. Again, the brightness of the prominences would be much greater from the aeroplanes, and it is known to be more difficult to detect colour in very brilliant objects.

A few British and American observers, and the majority of those from the continent of Europe, went to Scandinavia in order to obtain a higher sun and longer totality. Unfortunately the Cambridge party at Aal under Prof. Newall, and the American one at Fagerness under Prof. Mitchell (whose seventh totality this was) experienced cloudy conditions. The predicted weather conditions in northern Norway were much less hopeful, but actually they turned out perfect, and successful observations were made at Ringebu by Professors Säland and Vegard, and at Nyborgmon in Finmark by Prof. Linke and M. Krogness (of Tromsö). This latter region is not far from the Varanger Fjord, where some two hundred British observers went for the eclipse of 1896. I was myself in this expedition, but although the trip was most enjoyable we obtained no astronomical results.

Seeing one total eclipse generally whets one's appetite for more, so many readers may welcome a note on the most accessible ones in the near future. The first is on 31st August, 1932, total about Montreal and Boston (Mass.) with a duration of ninety-six seconds and an altitude of 30 degrees. Then June, 1936, total about Constantinople, but with a rather low sun. Then two Norwegian eclipses in July, 1945, and June, 1954, both occurring near noon, so that the conditions are very favourable. There are, of course, several eclipses in more distant regions, but they are only open to a favoured few. Special mention may be made of that of June, 1955, in the Philippines; totality in this lasts for over seven minutes, being the longest of any eclipse for about a thousand years.

I must express my indebtedness to *Nature* (9th July) for much of the information contained in this article.

The British Association.

THE British Association for the Advancement of Science will assemble for its ninety-seventh annual meeting on 31st August, when Professor Sir Arthur Keith, who succeeds H.R.H. the Prince of Wales as President, will deliver the inaugural address. It is announced that he will speak on "Darwin's Theory of Man's Descent as it stands To-day," a subject that will be of particular interest to those who last year at Oxford heard Professor Henry Fairfield Osborn, of New York, speak on the subject from another angle.

The meeting will, as usual, be of a week's duration, and no time will be lost in settling down to the programme. As sectional president in geography, Dr. R. N. Rudmose Brown has taken the subject of "Problems of Polar Geography." Sir J. B. Henderson, in the engineering section, is to speak on "Invention," and in mathematics and physics Professor Whittaker will deal with "Outstanding Problems of Relativity."

A number of questions of national interest are included among the other subjects provisionally announced. In the agricultural section Mr. C. G. T. Morrison has chosen "Agriculture and National Education." Another appropriate topic listed for discussion in the engineering section, is "Coal." As president of the education section, the Duchess of Atholl, M.P., will speak on "Broadening of the Outlook in Education."

Members of the Association will be able to inspect several of the departments of the University of Leeds, and a visit to the laboratories of the British Research Association for the Woollen and Worsted Industries is among those already arranged. To coincide with the meeting, the annual British Association Number of *Discovery* will be published next month.

Shakespeare's Youth: A New Theory and its Critics.

By Arthur Gray, M.A.

Master of Jesus College, Cambridge.

Following the publication of a new theory as to Shakespeare's education and youth, Mr. Gray here deals with the objections that have been raised to it in reviews, and adds evidence in support of it.

THE subject of this article is the theory advanced in my recently published book entitled "A Chapter in the early life of Shakespeare: Polesworth in Arden." This theory—which was by no means asserted as dogma—is that Shakespeare and Drayton were brought up, probably together, at a place in North Warwickshire, called Polesworth, and in the household of a certain Sir Henry Goodere. That Drayton was there domiciled and educated we know from his own statement. On Shakespeare's Stratford birth and parentage I threw no doubt. I did not question that at the time of his marriage and for two years after it he was at least occasionally resident at his birthplace, and that later he bought property and died there. Nor did I advance the view that the poet and the Stratford man were different persons, and when Mr. J. C. Squire drags Bacon of Norfolk into the tale I need only repeat what I wrote—that I am profoundly convinced, on the evidence of the Plays, that their author, whoever he was, was a Warwickshire man.

Foolish Stories.

So far my innocence, surely, was of the female dove kind. Was it "mere madness" that I ventured to believe that the education which Shakespeare is supposed to have had at Stratford school, between the ages of seven and thirteen, was not his sole equipment for his life's work; that he possibly, even probably, got a better education somewhere else? I analysed the education of all the principal literary "wits" contemporary with Shakespeare, and showed that in no known case was it confined to a country grammar school. The usual stories about Shakespeare's youth are full of foolishness and contradictions, and they are very late. But one thing the gossips who chattered a century after Shakespeare's schooldays never asserted—that he was educated at all at Stratford school. That is an assertion made in times quite recent.

One of my reviewers, supposing that I have some local connexion with Polesworth, is kind enough to invite me to write its parish history. I had propounded my theory and lectured on it before I had any acquaintance with the place and its neighbourhood. Strangely enough the suggestion came to me simply from the study of Shakespeare's plays.

Now let it be said at once that in his plays Shakespeare is never autobiographic. He does not tell us a single incident in his life; he does not refer to a single contemporary, Essex excepted in the prologue of *Henry V*. How should he? It is not the business of any good dramatist to trouble his audience with his private concerns. Sir Thomas Lucy may rest quietly in his grave at Charlecot. Why should Shakespeare rake up a ten-year-old grievance and puzzle a London audience with a caricature, utterly unlike the original, of a Warwickshire knight? As for supposed allusions to individuals in the plays, they are so many, so vague and so variant, that it is wise to put them all out of court.

But it is not unreasonable to suppose that the early surroundings and conditions of life of a writer may be reflected in his work. It is also not unreasonable to suppose that such reflections will be most apparent in his early work, written before they have been disturbed by the widening circle of experience in maturer life. Sometimes, as in the Kentish scenes of Dickens, early recollections are consciously reproduced; but drama does not allow such direct presentations. If we are to find any reflections of the circumstances of Shakespeare's early life in Warwickshire we shall not look for them in the plays written after 1600; in those plays the scene, if it is not historical, is laid in ideal places, Bohemia, Wales or a Mediterranean island. We shall find them mostly in his prentice plays, *Love's Labour's Lost*, *The Two Gentlemen of Verona*, *Midsummer Night's Dream*; perhaps in those plays of which he was only part author, *Titus* and the Third Part of *Henry VI*—more particularly in the essentially English scenery and company of *Henry IV* and the Induction of *The Taming of the Shrew*.

Silence about Stratford.

The first thing that strikes me in these plays, and in all the plays, is Shakespeare's total silence about Stratford. He mentions neither Stratford nor any village near it. He mentions none of the places which he should have passed through on journeys

between Stratford and London. In no play does he describe the society of a little country town like Stratford—aldermen, shopkeepers, prentices, as, for example, they are described by Heywood and Middleton. When Henry IV is marching from London to Shrewsbury Shakespeare informs us that he took the directest way, which actually passed through Stratford. Yet he does not mention Stratford, and Falstaff takes quite a different route through North Warwickshire, and there, it is to be presumed, became acquainted with Shallow. Shallow, whom we are asked to regard as Sir Thomas Lucy, and his neighbour, Silence, have nothing to say about Stratford, but a good deal about places in North Warwickshire. Arden Forest was evidently well-known to Shakespeare, but the nearest limit of it was several miles from Stratford.

But, you may say, Shallow is described as a Gloucestershire justice. Well, my answer is, first, that Charlecot is not in Gloucestershire; second, that the Cotswold Hills at their nearest end are a good many miles distant from Stratford; third, that Shakespeare only mentions them in connexion with the celebrated Cotswold games. Of course, he knew something of these games; so did Jonson and thirty-one other writers from all parts of England who celebrated them in a volume put forth in 1636.

The Village of Wincot.

If Shakespeare has nothing to say about Stratford and its neighbourhood he has a good many references to North Warwickshire, and some of them are very striking, particularly those to a village called Wincot, or Woncote, a place so unknown to fame that no dramatist would be likely to mention it unless he was familiar with the neighbourhood. It is, surely, remarkable that the mention of it comes in two different plays and in quite different connexions. There Marian Hacket kept her alehouse; there she went to fetch the third-borough; there the Lord has his residence; there he hunts and is visited by a troupe of actors. There also dwelt that arrant knave, William Visor, evidently near Justice Shallow and therefore forty miles away from Charlecot, and still further from the Cotswolds. When Shallow and Silence discuss markets they talk of Hinckley, twelve miles from Wincot, and Tamworth which is only four.*

* "Tamworth" is, I think, a fairly certain correction of the unintelligible "Samforth" of the quarto. "Stamford," the reading of the folio is impossible; the place is at least eighty miles distant from the Cotswolds and forty from Wincot. A critic objects that the type-setter could not mistake a capital T for the initial S seen in Shakespeare's signatures. He would be a bold man who would assert that the printer had Shakespeare's handwriting before him; besides, the perversities of Shakespeare's printers are simply limitless.

Coventry, Sutton Coldfield and its neighbour village, Hill, Barson (where goodman Puff dwelt) and Greece or Greet (the home of old John Naps) are all not far away, and all remote from Stratford.

The notion that Wincot is the hamlet, so named, near Stratford, is quite untenable. In 1722 it contained only two houses, whereas the northern Wincot was and is quite a populous village. The Stratford Wincot could have contained neither alehouse nor third-borough, and certainly had no deer-park or lordly residence. The supposition that the place meant is an insignificant hamlet in Gloucestershire is preposterous; that place is fifty-four miles distant from Stratford, and Shakespeare has no mention of any place near it. Remark further that Shakespeare mentions half-a-dozen places on the road between Wincot and London, but none northwards beyond Tamworth.

Pooley Hall.

If any shadow of doubt rested on this identification of Shakespeare's Wincot with the North Warwickshire village, it is dissipated by evidence which was in print in 1659—a whole generation earlier than the first appearance of the deer-stealing legend. Within half a mile of Wincot stands the fine Tudor mansion, called Pooley Hall, which in Shakespeare's day was occupied by the family of Cokain. In 1659 it was owned by Sir Aston Cokain, who was a friend of Massinger and himself a dramatist of sorts. He was born eight years before Shakespeare died, and had, therefore, companied with men who knew Shakespeare; men native to Wincot who were the sources of his information. Writing an epistle in verse to his neighbour, Clement Fisher of Wincot, he definitely says that this Wincot was the scene of Christopher Sly's tippling. Let me add that the Cokain family, like the Lord of the Induction, were notable hunters. One of them "impaled" a deer-park at Pooley in the reign of Henry VII; another, who was a contemporary of Shakespeare, wrote a History of Hunting. Even Sir Sidney Lee admitted that there was no deer-park at Charlecot, and Malone pointed out that as Sir Thomas Lucy did not preserve deer he could not prosecute Shakespeare for stealing them. Finally let me point to Speed's map of 1610, which shows twenty enclosed parks in the northern parts of Warwickshire, only two in the southern, and none at Charlecot; also to the pictorial map of Warwickshire in Drayton's "Polyolbion," which in the country containing Wincot shows a huntress with weapons of the chase, reclining under trees, and in contrast places in southern Warwickshire a seated woman with a grazing and tethered horse; and the Gloucestershire map pictures the Cotswold country

as an open land of sheep and haymakers with no suggestion of hunting. Drayton styles Cotswold " that great king of shepherds," and in " Polyolbion " has a long account of the Cotswold breed of sheep. " A Cotswold lion " was in Shakespeare's day a jocular term for a sheep. Remember that *all* Shakespeare's early plays, excepting the *Comedy of Errors,* which is a transcript from Plautus, have scenes of forest and hunting, but none after 1600.

Surely it is pertinent to ask why Shakespeare showed this singular addiction to the northern Wincot and the country that lay about it if his boyhood and prentice days were spent at Stratford, which is some forty miles distant. Well, Wincot and Pooley Hall were both contained in the large parish of Polesworth. Polesworth, anciently known as Polesworth in Arderna, was in the very heart of the Forest of Arden, whereas Stratford was some miles distant from it and lay in agricultural country.

Here begins my modest surmise, which I only stated as probability. Briefly it is that the boy whose parents could not write their names, whose youth is supposed to have been spent in sordid occupations, the wool-shop or the slaughter-house, did not end his education at Stratford school at the age of thirteen. I am rash enough to think that Southampton's friend was a man of breeding ; that " gentle " Shakespeare had from youth such qualities of refinement as the sixteenth century associated with gentleness ; that a man of his delicacy of mind and wealth of reading had an education and an outlook on cultured life beyond what Stratford town and Stratford school could supply. Talk of unaided " genius " is all beside the mark. I cry out for a single parallel in literary history of genius such as his that grew from such beginnings as the legend postulates, and there is no answer, save that one critic would counter me with Bunyan (!) and another with C. J. Fox, a statesman, not a poet, an aristocrat, bred at Eton and Oxford. The latter judicious writer insisted on Jonson's " small Latin and less Greek " as proof that Shakespeare was a " natural " poet, who owed nothing to education. Alas, he forgot that Jonson added

> Yet must I not give Nature all—thy Art,
> My gentle Shakespeare, must enjoy a part.

" For," says he, " a good poet's made as well as born." I suppose that at the present day there is no cruder misunderstanding of literary genius than the notion that the divine spark needs no bellows-blowing. Dickens had just the knowledge of books and men in early life that prepared him for writing " Pickwick " and " David Copperfield."

MICHAEL DRAYTON.

Drayton was brought up in a well-known literary household at Polesworth, and it is here suggested that Shakespeare, his contemporary, secured his education while a page to the same family.

Wincot was contained in Polesworth parish, and at Polesworth there was a large abbey of Benedictine nuns, who maintained a school in their monastery, whereat were brought up a great number of children of the gentry. At the Dissolution the nuns' estates were bought by Sir Francis Goodere, who pulled down most of the monastic buildings and built a manor house with the materials. This house was unfortunately destroyed about the middle of the last century, but the church and the gate-house range remain in good condition. In Shakespeare's youth the owner of the estates and occupant of the house was Sir Henry Goodere, who died in 1595 and was succeeded by another Sir Henry, who was his nephew and son-in-law.

It may be confidently asserted that, outside London, there was in Shakespeare's days no place in England which was the resort of such a refined and literary society as Polesworth Hall, or was so likely to furnish genius with opportunities for displaying itself. The scant records of the first Sir Henry mention that he was " at his book " when he was a prisoner in the Tower. The second Sir Henry was himself a writer, and he was intimate with Donne and Jonson, both of whom visited him at Polesworth. At an earlier time Lodge, whose " Rosalynde " furnished the materials of *As You Like It,* was pretty certainly a visitor. Holinshed lived a mile or so away at a place called Bramcote. Burton, of the " Anatomy," says that he was familiar with Polesworth Hall.

The Cokains, literary in several generations, were near neighbours at Pooley. Finally there was Michael Drayton.

Drayton was born, a year before Shakespeare, at Harthill, near Polesworth. He tells us that he owed the most part of his education to the elder Sir Henry, and that at ten years of age he was a page, apparently in Sir Henry's household, and had a "tutor" who encouraged him in the reading of poetry. He seems to have lived at Polesworth until he went to London, somewhere about 1591, where he was introduced by Sir Henry to the patronage of the Countess of Bedford. But he continued to visit Polesworth, and until his death, in 1631, used to spend the summer months at Clifford Chambers, near Stratford, at the house of Sir Henry's married daughter, Lady Rainsford, who was the inamorata of his Sonnets and named by him "Idea." Polesworth, the river Ancor, which flows past it, and the Forest of Arden are the constant subject of his verse, his "Tempe" and his "Helicon."

The Problem to be Solved.

Here comes the problem for which I offer a problematical solution—how to account for Shakespeare's presence at a place so far from Stratford as Polesworth, and for his introduction by Sir Henry to Southampton, just as Drayton was introduced by him to the Countess of Bedford. The elder Sir Henry knew the father of Southampton and had been imprisoned with him in the Tower. The younger Sir Henry was of much the same age as Shakespeare's Southampton, was a Fellow-Commoner with him at St. John's, Cambridge, and in later life had relations with him of a rather intimate kind. In 1571 John Shakespeare was Chief Alderman of Stratford and was commissioned by the Corporation to deal in all legal matters concerning the borough. In the accounts of 1572 the Corporation pays twice for horse-hire "to Mr. Goodere's." In 1571 Goodere came to Stratford to arbitrate in a dispute between the Corporation and a certain townsman, and was entertained by the Corporation at the Bear Inn. John attended all Corporation meetings at the time of this visit, and it is almost certain that then, or perhaps earlier, he made acquaintance with Goodere. John had a large family and within two years he was virtually bankrupt. My innocent guess is that at some time in or after 1571 he managed to get little Will accepted as a page in the Goodere household. Note Shakespeare's constant introduction of pages and gentlemen's boys in his earlier plays.

I admit that there are other possibilities to account for Shakespeare's acquaintance with Wincot. He may have been in the service of some other patron, *e.g.*, Cokains or Fishers. He may have been a schoolmaster at Polesworth. The only part of Aubrey's rigmarole about him that deserves credence is that he was once "a schoolmaster in the country." But if so, he must have had a better equipment than that which a small boy could compass at Stratford school. Furthermore, if Polesworth had a school it was probably the old nunnery school, revived and maintained by the Gooderes, and perpetuated to this day in the foundation school there, built and endowed in the seventeenth century at the desire of a daughter of the younger Sir Henry.

But you will at once detect something like a flaw in my hypothesis. Drayton, who is more communicative about himself and his friends than most Elizabethan writers, never alludes to his boyhood companionship with Shakespeare. Well, though the two men were almost of necessity acquainted in London literary and dramatic circles, Drayton never mentions such relations. One critic is surprised that Jonson does not allude to their Polesworth connexion—Jonson, who does not tell us a single fact in Shakespeare's or Drayton's life—what should he say or know of their young days? In our times when school companionships are a strong and lasting influence and biographers attach much importance to them, it seems strange that Drayton should be apparently insusceptible of them. It was not so in the sixteenth century, when little record was made of school associations. Spenser, in his "Shepherd s Calendar," though he mentions two members of his college who became bishops, says nothing about Lancelot Andrewes, who was his schoolfellow in London and his college contemporary at Cambridge.

Michael Drayton.

However we may think of Drayton as poet, as a man contemporary evidence declares him to have been of a disposition timid, domesticated and respectable, and his engraved portrait witnesses to the truth of the judgment. The circle of his literary friends consisted of men of third-rate ability; he feared Jonson; the stage which he attempted would have none of him. He was incapable of estimating the greatness of Shakespeare, and has praise only for his "comic vein," the smooth numbers of which in *Midsummer Night's Dream* gave him material for his fairy poem, "Nymphidia." To echo the higher note of *Hamlet* or *Lear* was beyond his compass.

But take up his "Polyolbion" and read his long account of Arden. You will see that those early impressions which in Shakespeare faded as his soul

took breadth and height lasted in Drayton to late middle life. His descriptions are no borrowing from Shakespeare, but they are a gathering up of scenes and incidents which once he knew as Shakespeare knew them—perhaps in company with him. The forest birds are painfully described with some of the very words which Shakespeare gave them in his careless rapture. The hunting of the hart fills a large part of the book, and the wounded and weeping stag makes a picture once witnessed by Touchstone and Jaques. A more striking figure is the Hermit of Arden, an old man of sententious wisdom who lives in a "homely cell" and collects medicinal simples "in a little maund being made of osiers small." Does not the picture and the phrase call up that scene in *Romeo* where Friar Laurence from his "cell" enters with his "osier cage" gathering "baleful weeds and precious juiced flowers"? Perhaps too that "old religious man" whom Shakespeare discovers in the skirts of the wild wood of Arden?

As you will say, all is surmise; and I agree—surmise with circumstances. But if you ask for evidenced and documented fact about Shakespeare's education I can only reply that you will not get it. Facts there are—not many—in Stratford records, but none (his will excepted) to connect him with the man who shook the London stage. In the minds of the gossips who had so much to tell of the boy William he was associated in manhood days with tithes, malt, knit hose and such matters. And over all the traditional story hangs the fog of ignorance, contradiction and vulgar credulity exhaled during a century in which the curse resting on the disturbance of the poet's bones applied with equal force to inquiry about the poet, alive and in the making. But the voice lives—

the burst
And the ear-deafening voice of the oracle.

The oracle will not tell you all, will not say much about Apollo. But if you would know him you must worship in his temple, listen to the lingering echoes of his utterances, and so you may learn more than from the babble of tongues outside, re-iterating the old superstition that divinity rested in the shapeless lump that was worshipped at Ephesus. Αὐτὸς ἔφα—let the Master speak for himself. Only be modest in your interpretation of the oracle, lest in the parting words of the players' dedication you be "in some manifest danger not to understand him. And so we leave you to other of his friends, whom, if you need, can be your guides; if you need them not, you can lead yourselves and others. And such readers we wish him."

Correspondence.

BIOLOGICAL CONTROL OF PEST PLANTS.

To the Editor of DISCOVERY.

SIR,

In your May issue experiments now being made to control pest plants by the agency of insect parasites were described by the editor of the *Fruit Grower*. Mention was made of the tour Dr. Tillyard, F.R.S., has lately made in Europe and America on behalf of the Cawthorn Institute, Nelson, N.Z., in an endeavour to discover a suitable insect enemy of the blackberry, *Rubus fruticous*, which originally introduced into New Zealand for its luscious fruit is now proving such a pest.

Some of your readers may not have seen the official report on this tour, which has reached this country since your article was published. In the first section of this, Dr. Tillyard states:—

"There is at present only one completed piece of research along these lines, *viz.*, the attempt to control lantana in the Hawaiian Islands by the introduction of its natural enemies. In this case the line of attack was to try to prevent the plant from seeding. This attempt, though carried out some years ago without such safeguards as we should now deem necessary, was entirely successful. The plants left on the islands, failing to seed, gradually died out, and some blocks were burnt and cleared also. At the present time lantana is no longer a menace in the Hawaiian Islands.

"Prickly pear.—A much more ambitious attempt on a large scale is that being now carried out by the Federal Government in Australia for the control of prickly pear by insect enemies. It is perhaps too early yet to prophecy complete success for this vast enterprise, where no fewer than thirty millions of acres of land are involved, with an increase of the pest engulfing another million acres annually; but the latest reports indicate that a number of valuable insects have been acclimatized, and can do very fine work in destroying the pear.

"As a result of my studies and inquiries in America and Europe I feel able to state definitely that there is a very good prospect of either partial or complete control of a number of pest weeds in New Zealand, without exposing the country to any serious danger in other directions."

All those interested in combating what is now being recognized as a serious menace to agriculture will await further news of these New Zealand experiments with great interest.

Yours faithfully,

60 Palmerston Crescent,
Palmer's Green.

ALBERT HAZELL.

A KEY TO SPECIALIZED INFORMATION.

To the Editor of DISCOVERY.

SIR,

May I be allowed to offer my thanks to all those who have kindly responded to the request (published in your March issue) for information in connexion with the preparation of the Directory of Sources of Specialized Information, and at the same time beg those who could assist, but have not yet written to me, to do so at once, as we are fast approaching the close of our work. I should especially like to be able to include some more collections in the possession of private individuals.

Yours faithfully,

G. F. BARWICK,
Secretary, Association of Special Libraries and Information Bureaux.

38 Bloomsbury Square,
London, W.C.1.

Costa Rica: A Glimpse of the Maya Country.

By Sir Arthur Shipley, G.B.E., F.R.S.

While much interest is now being attracted by the remains of the ancient Maya civilizations discovered in Central America, the character of the surroundings in which these early peoples flourished has received scant attention in the press. The following describes a present-day journey through one of the Maya territories, by Sir Arthur Shipley, who we are pleased to state is making satisfactory progress after his recent illness.*

Of the four or five Republics I have visited in the Caribbean Seas my favourite by far is Costa Rica. To begin with it is of a manageable size. It faces both the Atlantic and the Pacific, and from the water divide one can see both oceans. To the north lies Nicaragua and to the south Panama, and by the time America has swallowed Nicaragua, Costa Rica will be between the nether and the upper grindstones. The population is attractive and far less mixed than any other South or Central American Republics. Out of a total of over three hundred thousand folk there are less than two thousand negroes and a few thousand native Indians, most of whom have not yet taken to civilization and are little seen. Of foreigners Italians and Germans are the most numerous, but on the whole the blood is singularly pure. The native Spaniards are descended from Galicians, one of the most hard-working and stable of the people in the Peninsula.

We landed at Port Limon, the chief seaport on the Atlantic side, and thence it is the bananas are shipped. It is a tiny little town, with a very passable-looking hotel and an ample plaza with avenues of fig trees growing out of curious aerial roots, and here a band plays in the evening and there are a substantial market and a good bathing pool. But nobody stops at Port Limon; they take the train which starts at the end of the pier to San José, the capital. For three weeks no train had been able to reach San José, and we were the first to do so. On boarding the train we were at once taken in charge by a large and very competent American dressed like Robin Hood in green, and we had not been in the train for twenty minutes before he gave us each a ticket indicating the number of our rooms at the hotel. It was a most perilous journey, for earthquakes are frequent and the route was honeycombed with deep gorges and ravines. For some miles we skirted the sea coast, watching through the palm-groves the surge of the continuous roll of breakers.

The next part of our journey lay through many square miles of derelict banana plantations, victims of the so-called Panama banana disease. For the last twenty odd years this disease has been rampant in many parts of Central and South America, and has had very serious economic effects on the price of bananas. It was first noticed in 1903, and in a few years it had devastated large areas in Panama and Costa Rica. It has affected the crop in Jamaica and throughout the West Indies and the Spanish Main. Nothing seems able to check it. It is caused by a microscopic fungus named *Fusarium cubense* which grows inside the vessel of the plant. The fungus enters from the soil by infecting the roots or any cut surface of the plant. Its spores can be conveyed almost any distance by wind or water, and they adhere to the feet of man and his tools and the hooves of animals and anything which comes in contact with the soil. The spores can remain in the soil for years—some say twenty years—and cases are on record where the infection was found three years after the field had been thoroughly cleared and limed. So far no one has found an immune and marketable variety of the fruit; those that prove to be immune being unsaleable. Probably the ultimate method of dealing with the evil will be by cross breeding.

We next passed between mountain-side farms where coffee, tobacco, sugar, and citrous fruits were all being grown. We mounted higher and higher

TYPICAL PUBLIC BUILDINGS IN SAN JOSÉ.

This Costa Rican city is laid out in magnificent style, though owing to the prevalence of earthquakes the buildings are usually only two stories high. On the left is seen the Post Office, with the Union Club in the right foreground.

* See "The [British Museum] Excavations at Lubaantun, British Honduras." By T. A. Joyce, M.A., O.B.E. *Discovery*, January, 1927.

until at ninety miles from the port we attained the height of five thousand feet, after which the line drops a thousand feet into the capital, San José. In the hotel we were received by a coal-black lady clerk enveloped in a bright green woollen shawl (again recalling Robin Hood) for the nights are cold at such an altitude. She was as scornful of us as any European lady clerk at an hotel office could be, but she just managed to tolerate us! The hotel belongs to an Englishman and is managed by a Frenchman, a very admirable partnership, and it has over two hundred beds. Each bedroom is provided with a bath, an excellent arrangement if there had only been some water, but the hotel was quite new when we stayed there and apparently the water had not been laid on. I do not think I ever saw such

CACOA CULTURE IN COSTA RICA.

Natives are here seen sorting and breaking open the cacoa nuts, which are being ground by the group on the right of the picture. (Photographs kindly lent by Mr. A. H. Stockley, Messrs. Elders & Fyffes, Ltd., Covent Garden, London).

wallpapers as I saw in the Gran Hotel Français; they were probably the latest thing in futurist Spanish art, weird designs in the crudest colours, but in spite of the wallpapers and the lady clerk we were made very comfortable.

Already the buildings at Port Limon gave promise of better things than one usually sees in the Caribbean. The well-laid-out park, the efficient-looking hospital, some, but not all of the buildings in the streets, all testify to the fact that we are amongst a people who appreciate well-built and well-constructed buildings. But when we get to San José we find still more evidence that the old Spanish occupation has left a more abiding trace than any of the other Caribbean republics visited. The Metropolitan Church or Cathedral is a finely-built structure facing an

LOADING BANANAS FOR SHIPMENT FROM PORT LIMON.

Many plantations are devastated by the Panama banana disease, which during the past twenty years has been rampant in Central America. An effective remedy has yet to be discovered.

admirably kept garden, and the Archbishop's palace is noticeable by its simplicity and well-thought-out proportions. The National Theatre would be a credit to any great city in Europe. Indeed, I do not know any theatre in London where the vestibule, staircase and the foyer are on such a magnificent scale. It is perhaps a trifle over-decorated, but the general effect is one of taste and even splendour. It recalls the National Opera House at Paris. Outside are simple and beautifully proportioned arcades where, in the hot Costa Rican evenings, the theatre-goers can take the air.

Costa Rica is governed by a single Chamber, and that Chamber is most luxuriously housed. Of all the Government buildings perhaps the President's house, which is largely built of wood, is the most modest, but the post office, the War Office, the police barracks and the national printing office are all substantial, and even beautiful, buildings. So are many of the private houses and even the shops—or, as they would call them, the stores—are handsomely built. Of course, as is usual in countries subjected to earthquakes, the buildings are but two stories high, but they lose little by not emulating the sky-scrapers of the north.

The town is unfortunately laid out on the American plan of squares with all the streets crossing at right angles, consequently one is always compelled to take two sides of a triangle, whereas in more reasonably planned cities one would have taken but one.

A great deal of the progress and the well-being of the Costa Rican republic is due to the great care that has been spent for years on public education. The

State maintains both the elementary education, secondary education, and the normal training of teachers at its own cost, and particular attention is paid to the education of girls. The richer Costa Ricans send their boys to Europe or the United States for their final education. The Government has provided certain scholarships which materially help the poorer members of the community to finish their education abroad.

San José has between fifty and sixty thousand inhabitants. The streets of the city are well laid, the electric trams frequent, the sanitation is good, and there are many open spaces, chief amongst which is a large *savannah* where golf is played. We visited the market-place, which is on a very extensive scale. One could buy almost anything there from the cheapest vegetables to richly-caparisoned Mexican saddles. The Director of Kew Gardens was with us and he was anxious to get seeds of certain plants. Whilst we were inquiring about these at some of the market stalls, one of those genial ruffians that one often comes across in Central America loafed up and said in very fair English, that if we wanted to get seeds the best place was the gaol, for there was the best garden in the city. So off to the gaol we all went. He seemed on most excellent terms with everybody, greeting the Governor heartily, smacking the gaolers on their backs and exchanging repartees with the prisoners who were all hanging out of their windows. Finally we said to him, "You seem very much at home in this place," to which he replied: "I should think I was, I have spent eight years here. In six months we are going to have an election, and if my man does not get in there will be some shooting, and it's likely I shall be back here again. It's just as well to be friendly with the folk who look after the place."

The Pasteur Institute.

Costa Rica is more up-to-date than any part of the Spanish Caribbean I have seen. They have excellent motor lorries which must come up from the Pacific side as there is no road on the Atlantic incline—nothing but a bridle path. The people we saw on horseback riding up and down between Port Limon and San José justified the feeling the Mexicans once held that horse and man were one animal. Owing to the excellent water supply electricity is very cheap, and most things are done in San José by electricity—for instance, nearly all the cooking. The electric light is also very efficient. The Pasteur Institute, founded originally by the Rockefeller Foundation, is in the hands of a most competent young Costa Rican. Some dozen years ago he won a lottery—which plays a large part in the life of the people. Instead of wasting his thousands of pounds in gambling, he went off to Paris where he became a qualified M.D.; then he took a course at Liverpool and a course at the London schools in tropical medicine, and now he is head of the Institute, which struck us as very efficient and well run. The Costa Ricans, again, were amongst the first to adopt the modern methods of pruning coffee, methods which were advocated some years ago by Mr. Carlos E. Chardon of Porto Rico, and which have had such great success in Colombia.

There are good shops which would do justice to a modern European city, and above all they have what we met with nowhere else—two bookshops, very good bookshops where a real book can be bought. One need hardly remark that they are run by Germans. There is a woeful want of bookshops throughout South America, and even in Buenos Aires, where the rent of a small flat is £950, one cannot buy such a book as Miss Haldane's "George Eliot," or Winston Churchill's book "The World Crisis," unless it is specially ordered from England.

Coming back to Port Limon next morning, we rose as high as Cartago, which had recently been destroyed by an earthquake. From here one can see both oceans and from here, like "stout Cortez," stare at the Pacific. But, of course, it was not Cortez, but Balbao, who from somewhere about Panama gazed upon that ocean. Whether Keats was ignorant, or whether it was merely that Cortez didn't scan, one does not know. As a matter of fact it was Balbao who was

> Silent, upon a peak in Darien.

But Balbao did not scan; and if words will not scan, what are the poets to do then, poor things? They naturally have to adopt another word.

That morning we slithered down five thousand feet to the coast, and it certainly was an alarming experience. We shot over trestled bridges, we shook the earth as we bounded on, and whenever we looked down a ravine we saw a railway truck and often a railway engine lying at the bottom. These ravines are so deep and narrow that

> . . . they give the stars at noon-day clear—
> Up the pass that packs the scud beneath our wheel—
> Round the bluff that sinks her thousand fathoms sheer
> Down the valley with our guttering brakes asqueal.

However, Robin Hood was with us and inspired a feeling of security. On arriving in the harbour we found the banana ship in place and the bananas being put on board without being touched by hand.

We also found a sloth hung on a pole, which in its turn was slung on the shoulders of two hunters. They

wanted us to buy this as a pet, but a sloth is not a very lively pet, being of a melancholy and unsociable disposition. It has certain peculiarities which are unique among mammals. For instance, the number of cervical vertebrae is not seven; secondly, its greenish-grey hue—very much like the hue of the Spanish moss seen all the way from Louisiana to the South American coast—is due to a small alga which lives on the animal's grooved hair and flourishes in the damp of the native forest. But I could not find amongst my fellow travellers anyone interested in the number of cervical vertebrae of the sloth, or in its methods of colorization.

There was a good deal of discussion when Waterton in his classical "Wanderings in South America" described the habits of the sloth. Sidney Smith, at any rate, appreciated the habits of the animal, for in reviewing the book in the *Edinburgh Review* of 1826 he tells us that the animal

lives not *upon* the branches, but *under* them. He moves suspended, rests suspended, sleeps suspended, and passes his life in suspense—like a young clergyman distantly related to a bishop.

Nobody has a profounder respect for the Church than I have. But when I got on the steamer and found the Archbishop of Panama occupying the vacant berth in my cabin I felt I could not face the odour of sanctity for twelve long hours—His Grace had already closed the porthole. I was really in despair, and for a time knew not what to do. There seemed to have been some sort of a church congress at San José, which had been held up there as others had been held down at Port Limon for three weeks, and there were a great number of eminent clergy on the ship. Grubbing about I found a stray Monsignor who did not seem to belong particularly to anyone or to any place. I lured him into my cabin and left him there with the archbishop while I sought the greater freedom of a stateroom with the more congenial society of the Director of Agriculture of the West Indies.

Billingham: A British Chemical Romance.

Among the outstanding papers at the annual meeting of the Society of Chemical Industry held in Edinburgh last month, was the lecture on "The Development of the Synthetic Nitrogen Industry in Great Britain," delivered by Colonel G. P. Pollitt, D.S.O. In the course of this, the first disclosure was made of the complete sequence of events in the building up of the Billingham works by Messrs. Brunner, Mond & Co., who took this plant over from the Government in 1920. The problem had been to a large extent a chemical engineering one. At the outset it was impossible to obtain the valves, joints, etc., required for high-pressure processes; they were not being made in this country. So the company's engineers set about making their own, and did it so well that their high-pressure apparatus to-day is simpler to operate and easier to maintain than ordinary low-pressure plants. The same was true of quantitative measuring instruments of the most exact kind which had to be introduced on a very extensive scale. The result is a plant and organization, every bit of which has been designed for its own purpose, entirely created and developed from within, and therefore completely understood by those responsible for it. The personnel has been built up in much the same way.

The results already obtained are remarkable, but hardly any limit can be set to the possible developments. From the national point of view the first outcome is to render this country independent of imported nitrogen supplies; Colonel Pollitt already foresees a stage when the importation of Chile nitrate may cease to be economic. The discovery, again, under the Billingham site of large deposits of anhydrite, which supplies the sulphate radicle in the place of sulphuric acid, not only cheapens production but makes the company independent of imported sulphur and sulphur compounds. The deposits are so large that ultimately the country generally may become independent of sulphur imports.

As regards actual products, the principal one is still ammonium sulphate, but other products include nitric acid, ammonium nitrate, anhydrous ammonia, etc., and provision is being made for converting the ammonia into ammonium phosphate and various forms of compound fertilizers. In this field to-day this country is second only to Germany. But beyond this the Billingham enterprise is engaged in work designed to make Britain independent of imported natural oils. The future programme includes the hydrogenation of coal, the manufacture of methanol from water gas, proceeding possibly up to the higher alcohols, and the conversion of methane, obtained by the distillation of coal, into acetylene gas.

These are amazing results to have been achieved within the space of a few years, and they deserve to be made known nationally and even internationally as an antidote to pessimism, and as a proof of what this country can do under real scientific leadership.

Bird-watching in the Shetlands.

By M. G. S. Best.

Nature lovers may find here a new idea for a holiday. Except for the Orkneys, the Shetlands are the only breeding place in the British Isles of the great Skua, and many other unusual birds may be observed there.

THERE is plenty of bird-life in the Shetlands if one knows where to look for it, though the birds are scattered far and wide over the wildest stretch of hilly country it is possible to imagine. Wide, windswept moors lie on the tops of the hills, mostly very wet and strewn with many small lochs. Everywhere is the murmur of little burns, carving their way deeply through the peat beds on their way to the sea, and one wonders if there is any spot in the whole of the Shetlands where the sea is actually lost sight of. It so intersects the land in every direction that it looks as if a winter's gale would wash the islands apart without any difficulty, if it were not that there is always the granite of the hills to be reckoned with.

The Noup of Noss.

Cliff-birds there are in plenty. The Noup of Noss, near Lerwick, is one teeming colony of birds for the whole of its five hundred and ninety-two feet. Greater black-backed gulls crown the crest of the cliff, gannets nest a little lower down the face, while kittiwakes and common guillemots in their millions crowd the ledges of the weather-worn cliffs to the lowest possible level above the wash of the waves. The noise of these birds is wonderful, a deep full-throated murmur—roar seems almost too strong a word to use, but it is a more accurate description—and when one passes in a boat along the base of the cliff watching this vast multitude of birds, the noise they are making is quite as impressive as is their numbers.

The harbour of Lerwick, with its huge herring fleet, owes a great deal to the gulls. The boats come in from sea during the morning, each newcomer trying to edge her way through the mass of craft already there, while the innermost ones, apparently hopelessly jammed against the quayside, make frantic efforts to get out! Each of these fishing-boats has brought its load of herrings destined for one or other of the curing yards ranged along the shores of the harbour. Herring and lesser black-backed gulls find this harbour a happy hunting ground where food in abundance can be had for the taking. Even the fish-nets piled on the decks have parties of gulls on them, searching for any morsels of fish that they can find.

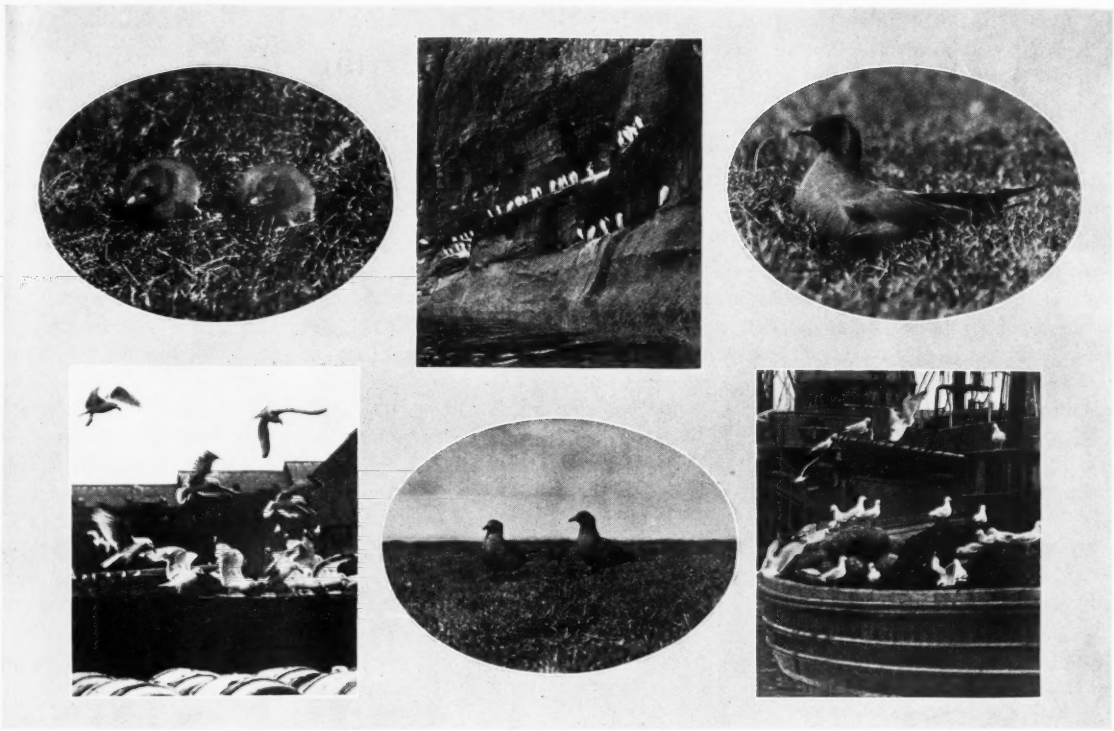
In the curing yards are gulls in thousands, fighting over the tubs containing the offal from the herrings. Some of the birds run close around the feet of the girls standing at the troughs gutting the herrings, hoping for a dropped fish. Everywhere birds are feeding; when they are satisfied they depart to a neighbouring roof, or the hillside above the town, to digest their meal and wash themselves clean in the fresh-water pools up there. No self-respecting gull considers the sea a satisfactory place to wash in if fresh water is within reasonable distance.

These herring and lesser black-backed gulls keep the harbour clean of fish refuse more thoroughly than any man-made plan could accomplish, and one cannot imagine what the place would be like without them.

We spent ten days in a crofter's house in the north of the island, in search of Bonxies and other birds of the moors, and a very delightful time we had there. There was a long stiff climb from the village, or "township," as they called it, to the moorlands on the top of the hills. The lower slopes had been cut for peat by generations of village folk, making the ground very rough to walk over. Yet the girls going out there with their creels on their backs to gather peat went knitting all the way.

Golden Plovers.

Once clear of this area, we waded through deep heather for some distance until we neared the tops of the hills which lay open to the full force of all the winds of heaven. Here nothing except the sturdiest stunted clumps of heather survived, and they gave one the impression of having "dug themselves in" to stay there at all, they were so strongly rooted. The ground above this heather, was covered with a short grass, wiry and poor in texture, struggling for a living with the moss which at this time of year showed as golden patches amongst the grey. On this stretch of ground the golden plovers had congregated, each pair owning its own territory, and conducting intruders through it from one boundary to the other. Very anxious they were, too, whistling plaintively, and rolling helplessly away from us along the ground, shamming broken wings or legs with every appearance of acute distress. We found two small



A GROUP OF BIRD STUDIES FROM THE SHETLANDS

From left to right, these photographs show: (1) Bonxie or great skua chicks a few days old. (2) Kittiwakes and guillemots on the lower face of the Noup of Noss, where they crowd the ledges in their millions down to the level just above the wash of the waves. (3) A dark Arctic skua on its nest. (4) Gulls scavenging the herring tubs in the curing yards of Lerwick harbour. (5) A pair of great skuas on their nesting ground. (6) Gulls on the nets of the Lerwick herring boats, a happy hunting ground for these birds, which keep the harbour clear of fish refuse.

chicks, lying flat, so much the colour of the moss that it was very difficult to distinguish them.

Golden plover seem to choose the highest parts of a moor to dwell on, preferring even higher altitudes than the curlew, but on these moors they remained well below the level of the Arctic skuas which were scattered over the open moor above. These "scooties," as they are called up there, varied in colouration from sooty grey, to birds with the palest buff breasts, pairing irrespective of colour, though often one of the pair was of the very dark type. Of one pair we photographed one bird had a very pale buff throat and collar, breast a darker buff, while the remainder of the bird was as dark as its mate. As the light-coloured bird was so much braver in returning to the nest than was the darker one, we concluded it must be the female, for there is no doubt the maternal instinct inspires the hen bird with the desire to sit on its eggs in spite of all intruders, while to the male mind there are limits to what may be expected of him. Though in some instances it is quite the other way about.

This light bird sat well on her eggs, lowering the shoulders of the wings on to the ground, and slightly spreading the wings, an attitude that is often noticed in birds covering chicks, but not so often when they are only sitting on eggs. When we were approaching their nesting area, the "scooties" became excited, flying around overhead. One bird would alight just in front of us, trying to lead us away from the nest, rolling from side to side as if wounded, flapping its wings and uttering most piteous cries. They never actually attacked us, though we were told that they were more vicious than the bonxies and often struck people.

Just beyond the "scootie's" nest lay a pool of water, fringed with heather and the banks of peat only rising a foot or so above the level of the water. Here we found a red-throated diver sitting on her two eggs. We wished her luck with them, for most of the nests of the other divers had been robbed by crow or skua, and it could only have been owing to the vigilance of the birds themselves that this nest had remained safe.

A diver is such a graceful bird in the water, especially

those with the beautiful rusty-red patch on the throat and soft-toned brown colouring. Without making a ripple, they will dive, or more often slowly sink their bodies below the water, leaving only the eyes and top of the head to be seen. And it is not easy to see that, as there is almost always a ripple on the lochs, and the tiny bit of head is lost amongst them. These birds swim a great pace under water, and suddenly appear a long distance from where they were last seen. One bird we photographed at one time grew so tame that she would hardly move off her nest when one went and stood by her. Then she would dive straight off the nest into the loch, only to turn round and come back again directly. She pushed herself up the bank on her breast, standing up when she reached her eggs, which she arranged carefully with her bill before settling herself down on them. But she was a great exception to the general rule of these birds, as most of them are very shy.

Still climbing upwards, we skirted many small pools, searching for more diver's nests, but in some cases only finding fragments of sucked shell to tell the tale. A party of hoodie crows, the young birds following their parents with clumsy, ill-balanced flight, may have accounted for one recently devastated nest; they looked capable of any mischief.

The Great Skua.

On the crest of this moor a pair or two of bonxies, or great skuas, had hatched their young, the families having arrived at the ugly age when the stubby quills of their first feathers were pushing their way through the soft grey down, and their lanky legs looked all too unsteady to support them. When the chicks have arrived at this stage in their careers, their parents give them credit for being able to take care of themselves. But when they are only a day or two old it is a very different matter, and the old birds swoop down on one with terrific force. One bonxie hit me on the face one day with its foot as it passed, nearly knocking me over, and causing a stiff swollen face for the next two days. The Shetlanders are justly proud of their bonxies, for the Orkneys and Shetlands are their only breeding places in the British Isles. Some years ago the birds were in danger of extermination, their main breeding colony on Hermaness, the most northern headland in Shetland, being reduced to but a few pairs.

Then Henry Edwardson, who has lived all his life within a short distance of the Head, and whose love for them was very great, built himself a hut almost on the top of the hill, from which he could see the whole width of the slope to the valley below. Here he has kept watch and ward over his beloved skuas for over thirty-eight years. His original hut was blown away during the winter storms of 1921, after which the Society for the Protection of Birds built him another, and here he spends the whole summer, waiting till the last of his charges has departed in September.

A Bird Romance.

The lower slope is occupied by a colony of Arctic skuas, and amongst them every variety of plumage can be found. One very dark male "scootie" brought his mate to Edwardson for scraps of bread, to the doorstep of his hut. He assures one that the same pair came every summer for twenty-eight years, and that then the female died of old age. The following year the dark bird brought a new mate to be introduced, but after a year or two she disappeared, and the male was left alone. On the day of our visit to Hermaness, the tame skua came towards the hut for his bread, but not liking strangers, he could not be persuaded to come as near as usual.

This headland is a wonderful sight when all the birds are there and their nurseries are in full swing. Arctic skuas screamed around us on the lower part, almost to the door of the hut. After that, we found ourselves among the bonxies, who occupied the open moor at the top of the hill. There is no fear of these great birds following the example of the great auk yet awhile, to judge from the thriving youngsters running from one tuft of heather to another in their efforts to hide themselves.

From the crown of the hill one looks down on the Muckle Flugga Lighthouse, standing on its solitary rock off the end of the Head, the northernmost light in the British Isles. On the neighbouring rocks is a colony of gannets, and gulls inhabit the ledges of the remainder of the reef. So there is no lack of bird-life there to keep the old man company, though save for the lighthouse-men ashore, who pass the hut to signal to their mates in the lighthouse, and the relations who bring him his weekly supplies, his peace is seldom invaded by any visitors.

Hermaness is a very desolate bit of country, but on a fine day, such as the one we were favoured with on our visit – so clear that we seemed able to see most of the islands of the Shetland group stretching away to the southward – with a warm sun and soft breeze that made it a joy to lie out on the hill and watch both birds and view, we felt that we would willingly have changed places with the watcher. And we could have wished for no better fate than to have lived the summer through on the hill, with the birds for our sole companions.

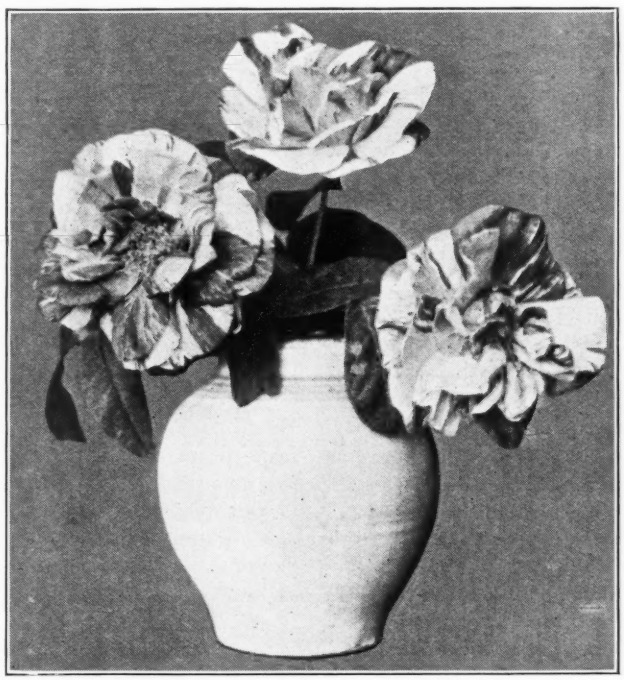
The Cultivation of Antique Flowers.

By F. A. Hampton.

Continuing from our March issue an article entitled "History from Antique Flowers," the author discusses the cultivation of certain plants from which, since they were "selected and in a way created by the gardeners who grew them, there may be discovered something of the taste and fashion of their period."

GARDENS of various periods can easily be built on a small scale, and the idea of antique gardens has already caught the public taste. The sunk Dutch garden of William and Mary's time has long been popular—though it is seldom planted with the flowers of the period—and more lately the Elizabethan knot garden, with its intricate patterns worked in clipped box and Lavender Cotton, has come into fashion; while at a recent Chelsea show a mediaeval garden was exhibited, surrounded by a wattle fence and enclosing a series of raised beds.

The Dutch paved garden fits neatly and not incongruously into the small garden space attached to houses in or near towns, while the wattle garden provides immediately a sheltered enclosure for a new house and the raised beds afford admirable drainage for plants which are impatient of our wet winters, as, indeed, they were probably intended to do in the ill-drained soil of mediaeval England. But the knot garden, especially if correctly embellished with carved and painted woodwork, is rather more difficult to fit into modern surroundings without evoking the faint suggestion of a museum attaching to period rooms and complete collections of period furniture, and the collector of antique flowers will probably prefer to arrange his plants according to his own sense of fitness rather than follow any formally historical plan.



ROSA MUNDI, A SEVENTEENTH-CENTURY FLOWER.

This is a variety of the rose of Provins, from which mediaeval druggists manufactured the medicine known as syrup of roses. *Rosa Mundi* is sometimes grown under the name "Cottage Maid."

There is a rich variety of old flowers from which to select; the old roses alone are sufficient for a specialist and at least one or two should find a place in every garden. The oldest in cultivation are probably the closely-related *Rosa centifolia*, *R. gallica* and *R. damascena*. *R. centifolia*, our Provence or cabbage rose (the "provincial rose" of Shakespeare) is almost certainly a species mentioned by the Greek writer Theophrastus ("Ροδον ἑκατοντα φυλλον"), and one of its best garden varieties is the pale pink "rose des peintres," which was a favourite with the Dutch flower painters. The damask rose may or may not have been brought home with the damson from Damascus by the Crusaders, but it has been cultivated in Persia from time immemorial, and as it grows on Omar Khayyam's tomb at Naishapur it is probably the rose of the Rubaiyat. It has a cheerful, semi-double flower of bright carmine and is never velvety crimson like the damask rose of literature, which is probably a *gallica* or rose de Provins, a type said to have been brought from Syria by Count Thibaut VI in the thirteenth century. It grew so well in Provins that the little town claimed the monopoly of supplying the druggists with dried petals for the manufacture of the syrup of roses which, on the principle of sympathetic magic, was the mediaeval version of pink pills for pale people.

At a later period local chemists discovered that the petals of the rose de Provins were exceptionally rich in iron. A pink and white striped variety of it, first noticed about the end of the seventeenth century, became known as *Rosa Mundi*, and is sometimes found in old gardens under the name "Cottage Maid" or more often as "York and Lancaster," a name that belongs properly to a more ancient parti-coloured rose, which suggests the work of the gardeners in "Alice in Wonderland" by bearing pink, white and striped flowers on the same bush.

All these roses have an incomparably sweet scent, deepest in the gallicas, softer and perhaps more delicate in the Provence group. But not all the old roses were fragrant, for one of the most characteristic, the double sulphur yellow (*Rosa hemisphaerica*) is quite scentless. This was introduced into western Europe by Clusius about 1607, who noticed a double yellow rose in some toy gardens of cut paper ("*Chartaceos quosdam hortulos*") in Vienna, and learning that they came from Constantinople wrote to one of his correspondents there on the chance that it might have been copied from a living original. Clusius' happy guess, which was almost an inspiration, turned out to be correct, and after long delay the first double yellow rose to reach Europe was sent to him. And ever since then gardeners have been trying to make it flourish in this country and giving confident but diverse recipes for success. "The double yellow Rose is hard to blow," says John Cowell of Hoxton in 1732, "and some curious Gentlemen have attempted it, without success, by nailing it against a Wall, but in the open Ground it will do very well, if . . . " etc. As a matter of hard fact it is not really suited to our climate, and except in favoured places it only flowers well in an exceptionally dry summer, though there is, or used to be, a very fine bush of it in a garden near Woking.

Scented Plants.

Although our ancestors were too catholic to reject a good rose because it had no scent, they gave rather more attention to scented plants than we do, since they partly took the place for them of perfumes and scented soaps; but we are not much behind them in our appreciation of flower scent, and hardly any of the plants which contributed to the fragrance of the old gardens have been allowed to become rare. There is one, *Hesperis tristis*, which is seldom seen nowadays but is well worth growing, partly for its old name of "Melancholy Gentlemen" and partly because, though it is a dull, liver-coloured thing by day, its flowers give out a spicy, far-reaching scent at night when they open to a dusky purple. Its habits and appearance suggest a noctambulant French poet of the decadence.

A fabulous scent, of curious and haunting sweetness, belongs to the true spikenard (*Nardostachys jatamansi*), which was the most precious perfume of antiquity. It is a modest little plant, with tufts of pale green leaves and umbels of small lilac flowers, which comes from the alpine bogs of the eastern Himalayas but takes kindly enough to life in the rock garden. The leaves as they wither give out the rank, mangy-dog smell of the nearly related valerians, and only the fine fibrous roots contain the famous scent, which suggests a mixture of patchouli with a little musk. The flowers have a faint musky scent like that of the alpine poppy.

The Famous Glastonbury Thorn.

A plant with associations nearer home is the Glastonbury thorn, which sprang, according to one legend, from the staff that Joseph of Arimathea drove into the ground on a hill near Glastonbury, where he began his missionary campaign against the "druids" and their "Aegiptian learning." According to another legend it grew from a piece of the crown of thorns brought by Joseph, with the Holy Grail, from Palestine. In the sixteenth century the historical bush was growing at Glastonbury Abbey and drew large crowds of pilgrims by flowering on Christmas Day. Slips of it were distributed to neighbouring monasteries and, although most of the bushes were destroyed at the Reformation, a few were preserved in private gardens. Their descendants are still with us, flowering a little less punctually than of old, but giving a few blossoms and a queer foretaste of spring at intervals throughout the winter. Botanically it is no more than a variety of the common hawthorn with the peculiarity, not uncommon in its family, of flowering twice a year. "A strange effect," Sir Thomas Browne says coldly, which is "naturally taken for miracles by weaker heads."

Older still in cultivation, though their history is not illuminated even by a legend, must be the two flag irises "Kharput" and "Atropurpurea." These are both natives of eastern Europe and Asia Minor, but they are naturalized in India; Kharput in Kashmir and Atropurpurea about Khatmandhu, whither they must have been carried by one of the early waves of invasion from the west. Alexander the Great *may* have had a hand in their distribution or, to speculate in another direction, they may possibly have been introduced in association with a religious cult, for the flag iris is known to the southern Slavs as "Perunitsa," the flower of Perun—a thunder god of

respectable antiquity, whose flower is still supposed to protect houses from lightning. They are two very fine flowers, whatever their history may be, and so is another flag iris, the pure white variety of iris albicans (known in gardens as "Princess of Wales") which, if less ancient, has wandered nearly as far. For it is invariably planted in Mohammedan cemeteries and, outlasting the gravestones, its distribution round the Mediterranean corresponds exactly, as the late Mr. Dykes was the first to point out, with the extent of the permanent Moorish settlements.

There are not a few "association items" for the collector of old plants, if he cares to have them. A house-leek still grows where Linneus planted it on the wall of the botanic garden at Upsala, and a piece of it has been brought to England and is spreading round among those who value it for its association. Inevitably there are Napoleonic relics; slips from the famous willow tree at St. Helena and the spurious, but very charming, "St. Helena violet," which was almost certainly not carried by Napoleon to St. Helena and brought back again by pious hands. Perhaps the legend is an echo of the earlier banishment from which the exile returned, as he promised, "*avec les violettes.*"

The oldest antiquity of all is the Maidenhair Tree, the only survivor of its family, whose fossil trunks are common in the English coal measures. It has never been found wild, but has been preserved, perhaps from some dim recognition of its antiquity, round the Buddhist temples of China and Japan. Sir David Prain always held that the "willow" of the willow-pattern plates was really intended to represent an old gnarled specimen of the Gingko.

These are a few of the kind of plant that the antiquary who is also a gardener may care to collect. The varieties are almost endless, from the common, rampant Balm to the last surviving clump (if such there be) of one of the carnations raised by Master Tuggy in his garden by Westminster Abbey. They have all, except the "association items," beauty and a certain stamp of character that makes them worth preserving, even in a garden that includes the best of our modern introductions, with which the old plants make no pretension of rivalry.

BIBLIOGRAPHY.

To the late Canon Ellacombe of Bitton we owe the preservation of many old plants, some of which are described in Henry N. Ellacombe's "In a Gloucestershire Garden." (Edward Arnold. 1895.)

Many of Canon Ellacombe's old plants have found a home in Mr. E. A. Bowles' garden, and other "antique flowers" have been added to them; see therefore "My Garden in Spring," "My Garden in Summer," "My Garden in Autumn." (E. A. Bowles.)

For contemporary description see Parkinson, "Paradisus in Sole terestris" (1629); Gerard, "Herbal" (1597); Clusius (de l'Escluse) "*Rariorum Plantarum Historia*" (1601).

"Shakespeare and the England of His Time."

On Friday evening, 29th July, Professor Sir Arthur Quiller-Couch delivers the inaugural lecture of the summer meeting on "Shakespeare and the England of his Time," which is being held at Oxford until 18th August. The first part of the conference concludes on 8th August, but tickets (two guineas) may still be obtained from the secretary to the Delegacy of Extra-mural Studies, 40 Broad Street.

Analysis of the programme shows that the lectures may be grouped in several main divisions, the title of the first being suggested by the paper which Professor George Gordon presents on "Shakespeare's Life and Work." Lectures on the tragedies, including a separate paper on *Othello*, by Mr. H. F. Brett-Smith, are followed by nine others in this category on the Roman plays, the English historical plays (Sir John Marriott, M.P.) and the comedies. "Some Shakespearean Failures" are to be dealt with by Mr. H. V. D. Dyson, of Reading University.

Selection may next be made under the heading "Shakespeare in his study," on which Professor Dover Wilson, of London, has chosen to lecture. An examination of the Italian sources of the plots is undertaken by Miss K. M. Lea, while "Shakespeare and England" will be discussed by Mr. E. W. Gillett, of Birmingham University. Shakespeare and ethics, and another on religion, are the subjects of lectures respectively by the Rev. Dr. Gow and Professor Clement Webb, these being among a number of papers of wider interest on religion, philosophy, and ethics which are open to members of the Shakespeare meeting. Several classes are also available at a small additional fee, "Some Types of Character in the Plays" being a subject of interest in connexion with the lectures just mentioned. This Class is conducted by Miss Sheila Dimsey, and includes dicussion on the hero and heroine of tragedy and comedy, the fools of comedy, and on the women and children of the historical plays.

"The Interpretation of Shakespeare," by Professor Gordon, heralds several addresses on this aspect, including, by the same authority, a study of Shakespeare's

language; "The Sonnets as Poetry," by Mr. A. M. D. Hughes, of Birmingham, who also speaks on "Coleridge and Hazlitt on Shakespeare"; "Textual Criticism" will be dealt with by Mr. Slingsby Roberts; and the appreciation of Shakespeare in France and in Germany are other subjects of kindred interest.

The Elizabethan theatre is considered in a paper on Shakespeare's stage and its effect upon his plays; with lectures on his stagecraft; and on his audiences. Tudor music will be discussed, with illustrations, by the Canon of St. George's Chapel, Windsor Castle, the Rev. E. H. Fellowes, D.Mus., while a delightful opportunity to hear unaccompanied choral singing of Elizabethan motets and later music will be afforded by the programme which is to be sung on the steps of Christ Church Hall on Sunday evening, 7th August. Modern dramatic interest is provided for in papers on the presentation of Shakespeare on the stage to-day, by Mr. Nugent Monck, Director of the Maddermarket Theatre, Norwich, and another practical expert will speak in Miss Lilian Baylis, manager of the London "Old Vic," who deals with "Shakespeare for the People."

Though contemporary environment and the play are, of course, intimately connected, the England of Shakespeare's time is to be considered separately from the theatre in a number of papers. A trustee of Shakespeare's birthplace, the Rev. E. I. Fripp, will speak on Shakespeare's Stratford, to be followed by the opportunity to visit these places by a special excursion. Four lectures on Shakespeare's London will deal with the Town, the manners of the Town, Sports and Pastimes, and the Theatre; while the economic organization of society in Shakespeare's England will be described and discussed in one of the additional Classes conducted by Mr. E. Lipson, university reader in economic history.

Finally, a paper characteristic of an important aspect of the subject is that by Professor Dover Wilson on "Shakespeare in the Class Room." A course on "Verse-speaking," of interest to teachers no less than to actors, is arranged as an additional Class under Miss Irene Sadler, medallist at the Oxford Verse-Speaking Contest of 1924, who will also give readings from the plays and sonnets during the conference. "The production of Shakespeare in schools" concludes these educational discussions, the subject being introduced by Mr. E. C. Matthews, assistant master at Haileybury College.

Opportunity will doubtless be taken by the Oxford visitors to make themselves acquainted with the colleges having associations with their period. A Shakespeare exhibition is arranged in the Bodleian Library, while another attraction is the dramatic performances which the Oxford Players are to give under the direction of Mr. J. B. Fagan. The excursion to Stratford, mentioned earlier, is planned for Saturday, 13th August, when parties will motor there for a matinee performance at the Shakespeare Memorial Theatre.

Books Received

Picture Postcards. Sets E 49 and E 50. (British Museum: Natural History. 1s.).

Modern Eclipse Problems. By F. J. M. Stratton, D.S.O., M.A. (Oxford University Press. 2s. 6d.).

The Father in Primitive Psychology. By B. Malinowski. (Kegan Paul Ltd. 2s. 6d.).

The Soviet Union Year-Book, 1927. Compiled and edited by A. A. Santalov and Louis Segal, Ph.D., M.A. (Allen & Unwin Ltd. 7s. 6d.).

Vulcan, or the Future of Labour. By Cecil Chisholm. (Kegan Paul, Trench, Trubner & Co. Ltd. 2s. 6d.).

Picture Postcards. Sets F 18, 19, 20, 21, C 20. (British Museum: Natural History. 1s.).

Apes and Men. By H. Peake and H. J. Fleure. (Oxford University Press. 5s.).

Hunters and Artists. By H. Peake and H. J. Fleure. (Oxford University Press. 5s.).

Social Life in the Animal World. By F. Alverdes. (Kegan Paul, Trench, Trubner & Co. Ltd. 10s. 6d.).

Eruptive Rocks. By S. J. Shand, D.Sc., Ph.D., F.G.S. (Thos. Murby & Co. 20s.).

The Life of the White Ant. By M. Maeterlinck. Translated by Alfred Sutro. (George Allen & Unwin Ltd. 6s.).

The Social Basis of Consciousness. By Trigant Burrow, M.D., Ph.D. (Kegan Paul, Trench, Trubner & Co. Ltd. 12s. 6d.).

A Bird Book for the Pocket. By Edmund Sandars. (Oxford University Press. 7s. 6d.).

Tropical Cyclones. By J. Monroe Cline, M.A., M.D., Ph.D. (Macmillan Co. Ltd. 21s.).

Chemistry. By W. H. Barrett, M.A. (Oxford University Press. 5s.).

The Nature of Disease. Part II. By J. E. R. McDonagh, F.R.C.S. (Wm. Heinemann (Medical Books) Ltd. 21s.).

How Psychology Can Help. By Rupert Croft-Cooke. (The C. W. Daniel Co. 1s. paper, 2s. cloth).

Sex and Repression in Savage Society. By B. Malinowski, D.Sc. (Kegan Paul, Trench, Trubner & Co. Ltd. 10s. 6d.).

A Comparison of the Records from British Magnetic Stations, Underground and Surface. By C. Chree, Sc.D., LL.D., and R. E. Watson, B.Sc. (H.M. Stationery Office. 3s. 6d.).

The Analysis of Matter. By Bertrand Russell, F.R.S. (Kegan Paul, Trench, Trubner & Co. Ltd. 21s.).

The Mind in Sleep. By R. F. Fortune, M.A. (Kegan Paul, Trench, Trubner & Co. Ltd. 5s.).

A.B.C. of Jung's Psychology. By Joan Corrie. (Kegan Paul, Trench, Trubner & Co. Ltd. 3s. 6d.).

Aeronautical Research Committee Reports and Memoranda. No. 1076. (H.M. Stationery Office. 1s.).

The Sixth Sense. By Joseph Sinel. (T. Werner Laurie Ltd. 6s.).

Wave Mechanics. By H. F. Biggs, M.Sc. (Oxford University Press. 4s. 6d.).

Castles in the Ether. By J. W. Cloud. (Simpkin, Marshall, Hamilton, Kent & Co. Ltd. 21s.).

The Clash of Culture and the Contact of Races. By G. H. Lane-Fox Pitt-Rivers. (George Routledge & Sons Ltd. 18s.).

British Progress in Air Surveying.

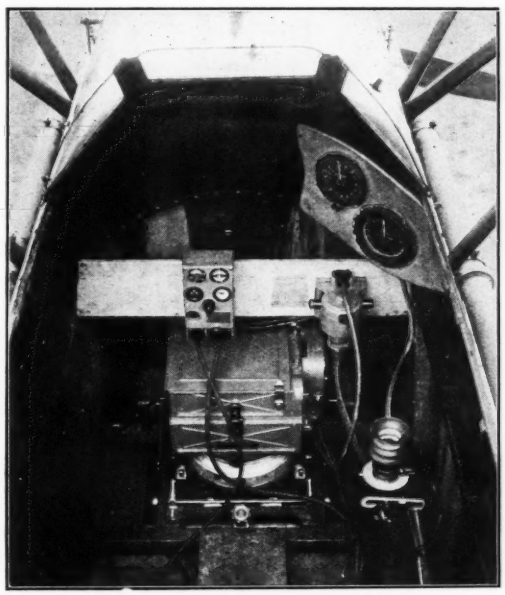
Major Hemming's Review.

Some commercial aspects of air surveying were dealt with in a recent lecture to the Institution of Aeronautical Engineers, by Major Hemming, managing director of the Aircraft Operating Company, who have kindly lent the illustrations for the following report. Air surveys are at present being undertaken in Rhodesia.

At the outset Major Hemming pointed out that his paper dealt with the commercial aspect of air surveying from his own personal experience. One of the few benefits we derived from the war was the development of aerial photography to a stage where it could be of great value for exploration and mapping work in the Empire. However, the authorities responsible to the Government for civil aviation failed to take advantage of this, and while concentrating their efforts on the development of air transport, it was left to private enterprise to develop air surveying entirely unassisted by subsidies.

As far as the Empire was concerned, the Canadian Government was the first to realize the value of the air camera, and leaving the development of air transport to other countries they concentrated on air surveying and forest fire-fighting. They soon found that their policy was justified, and since then many thousands of square miles of the Dominion have been mapped from the air. Successful private air surveys companies have sprung up in Canada as the result of this policy, and the Canadian Government undoubtedly have the finest Air Survey Department in the world, while the aeroplane and seaplane have saved many millions of dollars from the forest fire menace.

Although Canada has taught us a lot, we in this country have had to pay for that education, as the official support given in Canada, coupled with the development of air surveying in the United States, resulted in the quick development of new and improved aerial cameras and air survey aeroplanes on that side of the Atlantic. The aircraft and instrument trades in this country failed to grasp Canada's requirements with the exception of one British aircraft firm—Messrs. Vickers—who showed great enterprise by establishing a Canadian branch. The result is that to-day we find an American camera used as the standard camera by the Royal Canadian Air Force and by most of the Canadian companies, and that camera has undoubtedly given excellent service. True, the Eagle camera has now been produced in this country, and we think this is a great improvement on the American camera, but the fact remains that owing to this country's failure to grasp the situation in time, the Americans got in first.



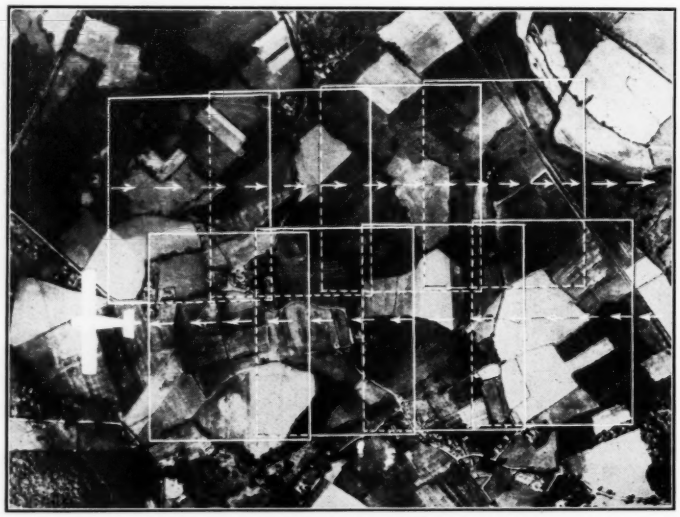
AIR SURVEYING APPARATUS.

Photographer s cockpit in a De Havilland machine, showing the installation of the Eagle air survey camera (centre) and Aldis aiming sight (right foreground), as used on the Ordnance Survey Revision Contract.

While the state-aided development of air transport was taking place in this country, air survey was left to carry out Mr. Churchill's famous dictum that "civil aviation must fly by itself." It proceeded to do this. Shortly after the war a British company sent out an air survey expedition, under the command of Major Cochran Patrick, to the Orinoco Delta in Venezuela and to British Guiana, where certain useful air survey work was carried out. A great deal of private money was lost, through no fault of the company, and much valuable experience gained. While no financial assistance was given by the Air Ministry, various members of the ministry went out of their way to help the company who were engaged in sending out the first British air survey expedition abroad, and the name of Wing-Commander Laws should specially be mentioned.

During the time this work was going on, Professor Melvill Jones and the late Major Griffiths were carrying out valuable practical research work in air surveying at Cambridge, with the aid of R.A.F. machines and pilots. As the result of this and of the work referred to in Venezuela and British Guiana, the Irrawaddy air survey contract was secured. A complete success was made of that and other contracts which followed, and to-day both the British companies engaged on air surveying have plenty of work to do.

The early days of air surveying were difficult ones, but happily the situation has changed and the airman and ground surveyor are working in close co-operation. For this satisfactory state of affairs we have to thank the Air Survey Committee which sits at the War Office, under the chairmanship of Colonel Winterbotham, an authority of world repute on air survey matters, and is made up of representatives from the Admiralty, the War Office, and the Air Ministry. Though this committee was not formed to assist civil aviation, but to study air surveying for military purposes, it has become a kind of fairy godmother to the companies interested in air surveying, while their official support and wise discernment has once and for all overcome the difference of opinion which previously existed between the ground surveyor and the airman. The civil aviation section of the Air Ministry have also been of great assistance, under Air Vice-Marshal Sir Sefton Brancker, while the personal interest that Sir Samuel Hoare showed by placing a room at the disposal of the two companies engaged on air surveying, so that they could demonstrate their work to the delegates of the Imperial Economic Conference, has already provided fruitful results.



HOW THE AIR SURVEYOR WORKS.

Having photographed a strip of the country, the aeroplane returns on a parallel line of flight, taking another strip of photographs overlapping the first.

Turning to the subject of apparatus and instruments, Major Hemming said that up to the time when the Ordnance Survey revision contract was carried out, "All-British" air survey contracts, with the exception of those carried out in Canada, were, he believed, carried out with the old war type L.B. plate camera, which was still understood to be doing yeoman work.

The introduction of the film camera specially designed for air survey work has enabled costs to be reduced, and the suitability of the film camera for such work was fully demonstrated on the Ordnance Survey revision contract. That contract was actually carried out by the F.8 camera, loaned to his company by the Air Ministry. Since then the commercial edition, known as the Eagle camera, similar in all respects to the F.8, has become available, and is in fact at present being used on the Northern Rhodesian air survey. The camera has many improvements on the old type, as it automatically photographs certain valuable data on each negative, thus saving a great deal of the laborious and difficult work of record-writing by hand on each negative, or alternatively keeping a filing system; while the fact that film is used simplifies and reduces the dark-room work.

A great deal of skill and ingenuity has been put into the design and manufacture of special instruments for enabling accurate navigation of the aeroplane to be carried out, and it is believed that most of the problems that these instruments are intended to solve will be overcome by the construction of special aircraft for air surveying. Practical and commercial requirements of air surveying show that air surveying must be reduced to a simple operation. It should not be necessary for the pilot to steer through optical sights, although these at present are of great value for partially overcoming the bad view which is inherent in the tractor aeroplane when used for air surveying. Major Hemming stated that it is hoped shortly to build a special air survey machine, and he believes that the improved view, higher ceiling,

and increased safety from liability to forced landing, will very materially reduce costs and increase output.

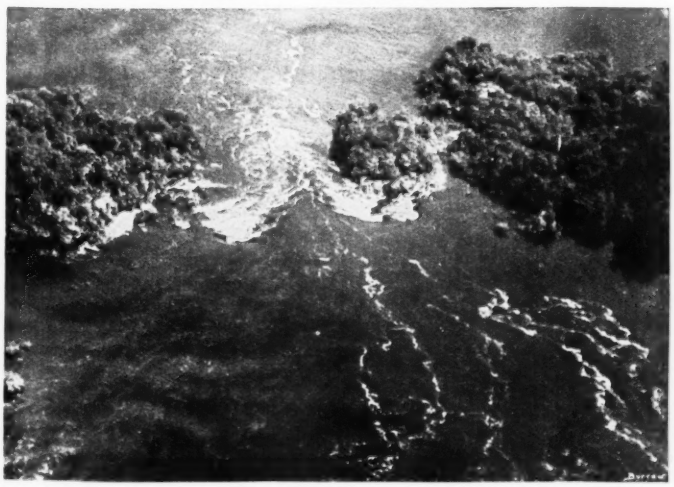
Though it was safe to say that the problem of straight and accurate flying has been solved, if an instrument is forthcoming which will enable us to ensure that the optical axis of the camera is truly vertical at the moment of exposure– that will help enormously. There are some very important problems to be solved in connexion with the ground side of air survey work, and one of the biggest problems facing those engaged on the commercial side of air surveying is the separating of the practical and the theoretical methods of mapping from air photographs.

German scientists have paid particular attention to contouring and producing instruments which enable the operator to plot detail by means of a pantograph from pairs of overlapping photographs examined stereoscopically. While these instruments are marvels of mechanical and optical skill, and have proved a very valuable contribution to air surveying, we have yet to be persuaded that they are the instruments for which we are looking. Similar instruments and methods have been produced in Italy and, it is understood, in France, and a considerable measure of success has been achieved with them.

THE OLD METHOD OF SURVEYING—

Negotiating a dangerous rapid in a boat, during an air route reconnaissance up the Mazaruni River, British Guiana. It took ten days to go two hundred and fifty miles by this means. Compare the air view below.

In the course of our researches into commercial methods for air surveying, Major Hemming continued, we have investigated practically all these methods, while the Air Survey Committee has been into the whole subject very thoroughly indeed. The successful experiment recently carried out at Arundel by Lieutenant Hotine for the Air Survey Committee, has shown that contoured maps on a large scale can be made from vertical overlapping air photographs, with the aid of the stereoscope and a certain number of spot heights established on the ground. It was also understood that a very promising instrument for contouring is being built in this country, so that it was wise to wait, as there is still an enormous amount of air surveying to be carried out in the British Empire which can be safely undertaken with the present tried-out systems at our disposal. The temptation to try and run before we can walk in air surveying is very great indeed. Simplicity will be the key to success as far as instrumental methods of air surveying are concerned.



—AND THE NEW: A STRIKING CONTRAST.

The same rapid photographed during an exploratory flight up the Mazaruni River, British Guiana, the similar journey of two hundred and fifty miles being covered in some three hours, as against ten days by the method illustrated above.

As regards quotations for air surveying, Major Hemming stated that the costs

frequently quoted are liable to be deceptive unless details are given on which these are based. Some costs simply cover the flying and photographic work, while others also include the laying down of the control, and the drawing, compilation and printing of the final maps.

It is impossible to lay down a standard cost for air surveying, as so many important factors contribute to the making up of these costs, and these factors vary according to the nature of the work. For example, if the air survey is to consist of a small scale survey in some Colony, the ground control will probably be supplied by the local survey department, who may also wish to prepare the maps from the photographs. The accuracy required, the control available, the nature of the country, the purpose for which the survey is required, and the weather conditions, etc., all have an effect on cost. Every problem has therefore to be treated on its particular merits, and frequently many discussions have to take place before a contract is finally entered into. This often entails sending away for several months an expert whose time is of great value, and as some of the areas to be mapped are very big, it sometimes takes a considerable time to negotiate a contract.

The size of the area has an important bearing on cost, the bigger the area the smaller the cost per square mile. For example, the total cost of mapping the 1,350 square miles of the Irrawaddy Delta by the air method was about £19 10s. per square mile, the scale of the map being 1/20,000. The cost of the aircraft was not taken into consideration in this figure, as they were machines proved by the Government of India. Since then, however, air survey costs have considerably fallen.

Typical Survey Costs.

Taking an imaginary case of an air survey of 60,000 square miles in jungle country intersected by rivers, on a scale, say, of 1/20,000—the company carrying out the work to be responsible for supplying, aircraft, hangars, all material, and for taking the photographs; the ground Survey Department to provide the control and make the maps from the photographs; the air work to be carried out in two seasons—Major Hemming estimated that the company would want £3 17s. to £4 per square mile for their part of the work. In another case, suppose a Government required a large area to be mapped, the company to do everything, including the printing of the maps and the control. Suppose the area is 400,000 square miles, for which an astronomical control must be laid down, and maps made to a scale of 1/50,000 with 25-metre contours. Assuming that the area consists of rolling country, mountainous in places, it is estimated that such work would cost from £3 10s. to £4 per square mile, including the printed maps, and would take four years to complete.

In this country costs of making photographic mosaic maps vary from £7 to £15 per square mile, according to the nature and size of the work, and the scale of the map required. Aerial photography can be applied with great advantage to the mapping of towns and cities, where town planning schemes are in contemplation, together with many other kinds of engineering work. For this reason we are likely to see it largely applied for these purposes in the future.

Future Developments.

Referring to the future, Major Hemming stated that his company are sending out their own ground surveyor in order to fix the control on which air maps in Northern Rhodesia are to be made. For this purpose a special wireless receiving set has been designed, and the control points will be fixed by astronomical observations and wireless time signals. This air survey is one which his company are carrying out for Messrs. Rhodesian Congo Border Concessions, Ltd. Already the Concession Company has constructed a main aerodrome with hangar and workshop and thirty-nine emergency landing-grounds in the heart of the African bush. This is a colossal undertaking, especially when it is considered that a further ninety-six landing grounds have been planned, but as it is expected to use the special air survey aeroplane later, the work on the balance of the landing-grounds has been held up.

In the discussion which followed, several speeches were made in support of the lecture, including tributes from the Governor of Nigeria, Sir Graeme Thomson. The Governor of the Gold Coast, Sir Gordon Guggisberg, himself a well-known surveyor, stated that the other day one-and-a-half millions were spent in straightening out the railway between the coast and Coomassie, which had been constructed before a map was made. If a photographic map can be obtained first, literally hundreds of thousands of pounds in road and railway construction will be saved, whereas a survey conducted by working through forests takes a long time; on the other hand, a photographic contoured map of the country will be a good and quickly made guide and will greatly help the Colonial Government of a tropical country in its work of developing railways and roads.

In conclusion, Major Hemming asks us to state that he will welcome inquiries at 8, New Square, Lincoln's Inn, London, W.C.2.

The Month's Wireless Developments.

ANOTHER LINK IN THE IMPERIAL CHAIN.

With the inauguration last month of a direct wireless telegraph service between London and Cape Town, when messages were exchanged between the King and the Governor-General of South Africa, the third group of beam stations was opened for direct communication with the Dominions, the beam services with Canada and Australia being already in operation. The fourth and last group of the Imperial wireless beam stations now under construction by the Marconi Company on behalf of the General Post Office, is to be completed immediately for service with India.

While the first tests showed that communication between England and South Africa could be maintained for a longer period than the eleven hours required under the conditions of the Marconi guarantee to the Post Office, it became clear as the experiments proceeded that the wave-length originally selected was too long to give the maximum period of communication during daylight hours. The change of wave-length necessitated certain modifications, not only in the transmitter itself, but also in the aerial and feeder systems. Though these alterations took some time to complete, they have proved to be fully justified, with the result that using two wave-lengths the stations are capable of carrying on a high-speed duplex commercial service between London and Cape Town for the greater portion of the day and night. It is now estimated that the stations are capable of handling about 160,000 words per day in each direction; during the seven days' official test, duplex operation amounted to a daily average of 17 hours 50 minutes at speeds of over 100 words per minute.

New Principle Employed.

The stations for South African communication are the first to have actually in operation the principle of using two wave-lengths, one for daylight and the other for night communication. When attention was first drawn to the use of waves below 100 metres for commercial working, the opinion was generally held that, although these waves could cover tremendous distances with comparatively small energy during the hours of darkness, their usefulness during daylight was restricted. Late in 1924, however, when carrying out short-wave experiments on his yacht "Elettra," Senatore Marconi observed that as the wave-length was gradually lowered below 30 metres, daylight signals improved while night signals deteriorated. These observations came as a surprise to many, but a subsequent investigation into the phenomena of short-wave propagation revealed the interesting fact that waves of the order of 15 or 16 metres were an excellent medium for communication in full daylight over long distances.

The standard time of the Union of South Africa is only two hours fast of Greenwich meantime, and sunrise and sunset in both countries therefore occur at nearly the same time. Thus the signals in the path of the beam between the two countries travel almost completely in darkness or in daylight. The wave-lengths most suitable for this service have proved to be 16 metres during daylight and 33 metres during darkness. In the case of the Australian service, dealt with in these columns in June, it will be remembered that instead of using two wave-lengths to maintain communication throughout the twenty-four hours, a single wave-length is used, transmission taking place in one or the opposite direction only according to which section of the earth between England and Australia is in darkness at the time.

The stations for communication with South Africa are built on the same sites as those for Canada, the transmission being effected from Bodmin in Cornwall, with the receiving stations at Bridgwater in Somerset. In Cape Town the transmitting station is situated at Klipheuvel, thirty miles north-east, while the receiving station is at Milnerton, five miles to the north of the capital. The English stations are both directly connected by land line with the London General Post Office, from which the transmission and reception of signals is controlled, operation at the wireless stations being entirely automatic.

The Eclipse Experiments.

While the scientific results of the many wireless experiments made during the total eclipse are at the time of writing still in process of correlation, a preliminary account of the most prominent effects observed has already been published. The effects of transition from darkness to daylight are frequently noticeable in causing, for instance, the fading of wireless signals, and at this time of the year they usually last from one to two hours after sunrise. In measuring the disturbances caused by the eclipse, therefore, control observations were taken for one or two days before and after the event, so as to distinguish between the effects of the eclipse and those of sunrise. According to *The Times*, readings of signals broadcast from London, taken with a direction-finder situated practically on the centre line of the totality shadow, showed that the errors in the apparent bearings of the transmitting station usually occurring at sunrise, decreased to an appreciable extent as time progressed, and then began to increase considerably as the phase of the eclipse approached totality. At the same time the signals received from London showed a very marked increase in strength. Thus, while at 6 a.m. the time signals and the announcer's voice were only just audible, about twenty minutes later the strength had increased so much that speech was audible at a distance of several feet from the telephone. Soon after the total phase of eclipse was over the signals decreased to their normal strength, but the variations on the direction-finder were found to continue until after seven o'clock, about thirty minutes later than the corresponding effects observed on the two previous days, or nearly three and a half hours after sunrise, showing an appreciable extension due to the eclipse.

Flying by Wireless.

It is doubtful whether the value of wireless to the aviator has ever been more clearly emphasized than on the recent Transatlantic flight accomplished by Commander Byrd. During more than half of the thirty hours his machine was in the air, the sea and usually even the sky was obscured by fog and clouds, with the result that bearings obtained from ships by wireless were the only satisfactory means of navigation. Until some instrument for locating position in foggy weather is discovered, the airman must rely on wireless, which after his achievement Commander Byrd predicted would play a great part in future transatlantic flights. The unfortunate circumstances in which he flew aimlessly over the French coast without succeeding in picking up signals were probably accounted for by fatigue.

(The third article in Mr. Liveing's new series, "Broadcasting: A New Social Force," will be published in our next issue.)

Book Reviews.

Ancient Rome at Work : An Economic History of Rome from the Origins to the Empire. By PAUL LOUIS. (Kegan Paul. 16*s*.).

Unrestricted private enterprise under the Republic produced a world of plutocrats and paupers ; the life of the Empire was stifled by universal State interference. This is one of the main impressions left on us by M. Paul Louis' review of some twelve centuries of history.

The general reader will find here an account of the chief developments in industry and commerce during the three great periods of the story of Rome, as well as interesting collections of statistics, or, when statistics are not available, of the conjectures of previous writers. The picture seems, on the whole, rather too gloomy. The positive achievement of the first two centuries of the Empire is not sufficiently emphasized ; we get instead an impression of vast misdirected activities which are soon to work their own undoing. Varro is quoted to show the decline of agriculture in the first century B.C. But Varro has more cheerful things to say. " What wheat shall I compare with the Apulian ? what wine with the Falernian ? what oil with that of Venafrum ? Is not Italy so richly sown with trees, that she seems from end to end one great orchard ? " It is true that the troubles of Italy in the first century were great. Yet, even then, there were Italians who admired their country beyond all countries on earth. It is undeniable, again, that the Roman Empire rested on a huge substructure of human wretchedness. Yet we must not forget such things as the speech of Aelius Aristides " To Rome," delivered in the middle of the Antonine period—an eloquent record of progress and prosperity.

" Duties, without rights "—there we have an abiding, a malignant feature of the Roman polity. There was always a large class deprived of positive incentive, moved only by force, fear, and hunger. The study of the early agricultural system shows already in existence those great evils of national character which followed so relentlessly in the path of the legions. Excessive formality ; lack of regard for human life—was not the slayer of an ox subject to the death penalty ? ; lack of originality, of inventive genius ; cold-blooded, unforeseeing selfishness ; these are among the qualities of the most unlovable of the world's great peoples. The nobles, in enriching themselves, had allowed an impoverished populace to assemble in the capital. An impoverished populace, close at hand, is a potential menace ; to pacify it, the government proceeds to plunder the more distant provincials, and to bind the whole world in a system which is economically monstrous. It was the interest of the ruling classes that the small farmers should not be driven out of existence ; yet the nobles fought the agrarian laws, fiercely and stubbornly. Like their language, they were imbued with the rhetorical spirit, the spirit which compels us to attribute the sum total of wickedness to our opponents. They yielded nothing but what they were compelled to yield.

The lack of inventive power, particularly on the mechanical side, is very striking. Ideas come from abroad, from the brain of an Archimedes or a Hieron. The Romans are excellent imitators ; but what will happen when a deadening world-wide domination has left no one to be imitated ?

Flesh and blood must redeem the intellectual deficiencies. The imposing temples and ramparts, the great sewers, are constructed in an agony of physical effort. We have a picture of the miners, crawling for miles along their cramped galleries, painfully climbing five hundred feet to the surface, a heavy load of ore on their backs. Their mechanical equipment was poor in the earliest ages ; it never made much improvement.

The gloom grows rapidly darker in the third century. The unsound economic system is strained by the onslaughts of savage tribes, by the raising of enormous armies to meet them, by the growing religious tumult. Bureaucracy increases till everybody is a functionary, born to a definite calling, compelled to pursue it. Work deteriorates, prices rise, and no edict can cure the root evil.

M. Louis does not stress the class-war of the third century, the war between bourgeoisie and peasantry, as Rostovtzeff stresses it. We are left with the general impression of a succession of unimaginative rulers striving to maintain a falling system by the use of force and still more force. When positive incentive has disappeared, all penalties tend to the extreme. It is death to sell the fruit of the *murex*, death to conceal foodstuffs, death to refuse the debased silver coinage. A tired world awaits the approach of the barbarian.

W. BEARE.

Protozoology. By C. M. WENYON. (Baillière, Tindall & Cox. Two volumes. 84*s*.).

> " Now I will explain what the law of diseases is, and from what causes the force of disease may suddenly gather itself up and bring death-dealing destruction on the race of men and the troop of brute beasts."—Lucretius : " De rerum naturae," vi, 1070.

The new book by Professor Wenyon is of the greatest value at the present juncture. It is perhaps the most careful and well thought-out of all modern textbooks on protozoology, it contains, at any rate, more than we can find within the limits of any other two volumes. The book is, as one would expect from the Director-in-Chief of the Wellcome Bureau of Scientific Research, one in which the protozoa concerned are largely those of a pathological nature. But this is by no means the whole truth. Every form of protozoa is mentioned with its dominant peculiarities.

The book has a profound and philosophical basis. As amongst human beings, protozoa afford examples of races of one and the same species. These differ *inter se*, and in their rate of multiplication, their size and shape, each race breeds true so that after a long series of breedings the same results are found in the resulting progeny. Hence there is always a difficulty in deciding whether you are dealing with two different species or with mere races of one species. And the different races react differently, at any rate in many cases, to the same environment. In fact, there is a specificity of parasite to host. Some parasites are unable to live in any other host than the one in which they are usually found. Thus *Plasmodium vivax*, which is the cause of tertiary malaria, cannot live in any other organism but man. Attempts to introduce certain parasites into a host are very often prolonged before any success is met with. A strain of *trypanosoma equiperdumum* from horses and laboratory animals were only successfully established after experiments with six hundred hosts ; but once established the parasite was readily inoculated from one animal to another. Either the fluid of the animal which had hindered inoculation had failed, or amongst the many parasites introduced one or two exceptionally favourable specimens had been inoculated. As a rule the specificity of parasitic protozoa is much more marked than is the case with vegetable parasites ; and further,

the vegetable parasite is much more apt to change its form in new environments. *Trypanosoma gambiensis* can be inoculated from man into laboratory animals, and the passage of infection may be so slow as to take a year to kill the host. Finally, however, the virulence increases to such an extent that the inoculation is fatal within a very few weeks.

A word or two may be said about the parasite of *Kala azar*. The organism which causes this is known as a Leishmann Donovan body, and appears to be a non-flagellate stage of a flagellate which infects the blood-vessels. This disease occurs widely in India and in China north of the Yangtse. Recently researching there—because in spite of the disturbances in China research still goes on—Hindle and Patton have shown that the sand-fly *Phlebotomus* fed upon infected cases becomes crowded with flagellates in its alimentary canal, and these are capable of infesting a susceptible host, very frequently a hamster. In one particular case the small mammal lived five months, and after its death its spleen, liver and bone-marrow were found to be packed with enormous numbers of the parasite.

It is quite impossible to do justice to this book in the short space at our disposal. It covers too large a field. It is extremely well illustrated and the coloured plates are beyond praise and the woodcuts run to nearly six hundred. There are interesting appendices on the fixation and staining of protozoa; and since the rules of zoological nomenclature are little understood there is a very full account of these. Then again we have a very complete list of the blood parasites of vertebrates and of the invertebrate hosts of the trypansomidae. These alone make a very valuable addition to the protozoologist's armour. There are nearly one hundred pages of references to literature with an average of about fifty entries per page. The index, again, is most complete and of very great value. The only complaint we have against the book is its immense weight; nobody but a very strong man could possibly read it without the aid of a reading desk, for each volume weights 4 lb. 7 oz.

A. E. S.

The Diary and Will of Elias Ashmole. Old Ashmolean Reprints II. Edited and extended from the original manuscript by R. H. GUNTHER. (Oxford. 7*s.* 6*d.*).

A much larger circle than the members of his own university should be grateful to Mr. Gunther (of Magdalen) for giving them so admirably in Old Ashmolean Reprints II, "The Life of Elias Ashmole, Esq., in the form of a Diary as written by Himself." For Elias Ashmole was much more than the mere founder of the Ashmolean. He was a "climber," and he accomplished his ends by all the approved means—he made use of his friends, he married judiciously, he practised alchemy, astrology, fortune-telling, healing and heraldry. He wrote a "History of the Order and Institution of the Garter"—and when offered that decoration by the King to wear, he refused it! All this, so the present editor tells us, he probably regarded as a far greater achievement than the creating of the first public Museum of Natural History in Great Britain, for which to-day he is rightly honoured.

Born, the son of a Lichfield saddler, on 23rd May, 1617, Ashmole married in 1638 Miss Elianor Mainwaring, "a virtuous, good wife," and though she only lived three years he re-married into the same family in 1649. The year 1660 saw him well established at Court. "June 16th, 4 p.m. I first kissed the King's hand, being introduced by Mr. Thomas Chiffinch. 18th, 10 a.m., was the second time I had the honour to discourse with the King, and he gave me the place of Windsor Herald." There are several references to Evelyn; while Pepys, meeting him at this time at Mr. Lilly's, found him "a very ingenious gentleman," an impression which can only have been strengthened when sitting next him a year later at dinner at the Guildhall. Students of the greater diarist will remember the passage: "I had a very good discourse with Mr. Ashmole, wherein he did assure me that frogs and many insects do often fall from the sky ready formed." Such in 1662 was the reputation of the founder of the first public Museum of Natural History in Britain. He died in 1692, having survived a fire in his study at the Middle Temple, which imperilled his unique collection of coins, and resisted in the previous year the renewed efforts of his friends to persuade him to stand as Member of Parliament for his native city. The diary has been printed twice before, in 1717 and 1774. The present year, which synchronizes with the reopening of the Old Ashmolean Building for Scientific Instruments as a Science Museum at Oxford and the dedication of a memorial window, is not one whit too early for the third edition.

H. A. J. W.

Stories in Stone. By WILLIS T. LEE. The Library of Modern Sciences. (Chapman & Hall Ltd. 15*s.*).

The work of an active geologist takes him into the company of many people, and probably for this reason he is the least understood, or, in other words, the most ridiculed of all scientific workers. After the first few pages of this book, however, nobody can hold the opinion that a geologist is a useless creature, for, by a series of illustrations of great projects brought to nothing through the lack of a little geology in the director, the author leaves no doubt in the mind of the reader of the practical value of a good geologist. The attempt to build a reservoir on rocks consisting largely of gypsum is a sufficient illustration of the author's point, but one cannot omit to mention that the recent development of the oil and coalfields of the world is entirely due to geological work and reasoning. In dismissing the activities of "doodlebugs" or water-diviners in a few cursory sentences, the author only echoes the feeling of modern field-geologists in that the successes of such are due merely to chance, whilst their failures—more numerous by far than their successes—are carefully hushed up.

The chapters on the geological systems are too obviously an account of the history of the Grand Canyon region of the Middle West of America to afford a general introduction to the subject, but to the reader already familiar with the broad outlines of geological history they are full of colour and interest. The lucid descriptions of the canyons, the natural arches, and the other physical features of the area are illustrated by a large number of excellent and well-chosen photographs. Of more general interest in this part of the book are the portions dealing with the Mesozoic dinosaurs and the Tertiary mammals. These, illustrated with the admirable restorations of Charles Knight, are undoubtedly of universal appeal.

Numerous aerial views of coastlines, mountains, and volcanoes give a truer idea of their characteristics than any map or terrestrial photograph. This new means of observation cannot, of course, replace the old methods of mapping, but the broad geological features of a district can be picked out with amazing rapidity, whilst the characters of the vegetation supported by the different formations yield by their own variation information about the outcrops of the underlying rocks. Such hints cannot fail to be of use in the first investigation of new lands, and, in the future, aerial prospecting promises to be of no small importance.

The later chapters, dealing with the development of the

various schools of thought in geology, again have a wide appeal. In tracing the various ideas of the origin of the earth from the earliest times down to the present day, the author acknowledges his adherence to the "Planetismal Theory" of Chamberlin. Whilst refraining from critizing this theory, the views set down by Jeans in the Halley Lecture of 1922 appear to be supported by more definite and reliable evidence. Why, in his concluding chapter on the rise of modern geology, the author makes no mention of William Smith—the Founder of modern geology—it is difficult to imagine, but the ideas of all mentioned are admirably set down.

J. E. HALLIDAY.

Antiquity: A Quarterly Review of Archaeology. Edited and published by O. G. S. CRAWFORD, M.A., F.S.A. Southampton. March, 1927; June, 1927. (5*s*. 6*d*. per part; annual subscription, 20*s*.).

A cordial welcome is due to this new venture in the periodical literature of archaeology. The great increase in recent years in public interest in discoveries relating to the past has as yet been met very inadequately by facilities for making widely known the results of research. The expert in touch with his fellow workers, and well-acquainted with the various channels of publication for specialists, may have no difficulty in keeping abreast with the latest discoveries: but although the general interest in archaeological matters is reflected in the daily press and other periodical literature, attention tends to centre on the spectacular, and the lack of exact technical knowledge is responsible for an uncritical acceptance of ill-founded reports and unconsidered views which is often misleading. On the other hand, publications which aim at dealing authoritatively for a non-specialist public with the whole field of science, such as *Discovery*, can devote relatively only a small space to archaeological matters. Mr. Crawford has courageously stepped into the breach and offers to the public a periodical dealing with archaeological topics of current interest which is written by acknowledged authorities, who are able to avoid the use of the more abstruse technicalities without detracting from the scientific value of what they have to say.

Of the contents of the first two parts it is hardly necessary to say more than that they reach an excellent level of achievement and are all of general interest. Some outstanding features may be mentioned. First of all perhaps, the editor's contribution to the discussion of what he calls "L'Affaire Glozel."

It will be remembered that in September of last year the archaeological world was startled by an announcement in a letter to *The Times*, from M. Salomon Reinach, of an epoch-making discovery at Glozel, near Vichy in France, of inscriptions on clay tablets associated with engravings of a degenerate Magdalenian type on pebbles, and objects of a neolithic culture akin to that of the Aegean, among them an idol of the fiddle-type familiar from especially the eastern Mediterranean area. As was at once realized, the importance of the inferences to be drawn from this discovery was very great. Quite apart from the interest of inscriptions from such an early stage of culture, engravings of a degenerate Magdalenian type which belonged—judging from the associated objects—to a date somewhere about 4000 B.C., implied that the Magdalenian period, the last great phase of the Palaeolithic Period, might be brought down as low as 5000 B.C. or some five to seven thousand years later than the usually accepted date. Further, as M. Reinach pointed out in a letter to the present writer, the discovery might be regarded as lending support to the views of those who hold that the origin of civilization was to be sought in the West rather than the East. In the June issue of *Antiquity* Mr. Crawford, after a personal examination of the objects and the site of their discovery, maintains that we have to deal with a forgery, and not a very clever one at that—a conclusion in which he finds himself at one with the Abbé Breuil.

A communication of the greatest interest on account of the novel element which it introduces into British archaeology, is the description by Mrs. Cunnington in the March issue of a new type of prehistoric monument. This is a circle on the Wiltshire Downs near Amesbury, discovered by means of an air photograph, of which the remarkable feature is the use of timber in its construction in a manner which is perhaps best indicated by the author's improvized name "Woodhenge." One half had been explored at the time of writing, and the further excavations of the current season are to be described at the meeting of the British Association at Leeds in September next.

Of the remaining articles we may mention in the March number "Lyonesse" by Mr. Crawford, an account of the Roman Frontier by Mr. W. G. Collingwood, "Orientation" by Admiral Boyle-Somerville, and "Stonehenge as an Astronomical Instrument" by Mr. A. P. Trotter, "Some Prehistoric Ways" by Mr. R. C. C. Clay, and "Maori Hill-Forts" by Mr. Raymond Firth. Last, but by no means least, is Professor Gordon Childe's review of the part played by the Danube valley as a trade and culture route by which the "neolithic culture" and the arts of metallurgy reached Central and North-western Europe. For the June issue Professor Childe's book on the Aryans serves as a peg on which Professor Sayce hangs a review of the bearing of recent archaeological discovery and philological investigation in the Middle East upon the problem revived by Professor Childe after fifty years. Dr. Randall-MacIver raises some interesting questions in relation to the debt of Rome to the Etruscans in matters in which it was not acknowledged by Roman writers, and Dr. Hooton's puts forward views on the place and manner of man's origin which are perhaps more novel than convincing. Professor Mawer on "Place-Names and Archaeology," Mr. Collingwood on "Christian Vikings," Mr. C. G. Stevens on "Ancient Writers on Britain," and Flight-Lieutenant Maitland on some interesting but little understood stone monuments of Arabia, all have something to say which is either of special interest at the moment or is new, and would call for extended reference did space allow. It is hoped, however, that enough has been said to indicate that *Antiquity* is a venture which deserves the support of all who hold the advancement of archaeological studies to be a matter of public interest.

E. N. FALLAIZE.

British Ants, their Life-history and Classification. By H. ST. J. K. DONISTHORPE. Second edition. (Routledge & Sons. 25*s*.)

This book has been brought up-to-date, so far as records of ants in these islands is concerned, and it has been revised throughout, but this revision does not appear to have extended to the part dealing with the structure, which contains a number of mistakes. Apart from this section the author has obviously taken great pains to bring the work up-to-date, and its chief value lies in the fact that it is so largely based upon his own observations. The author's review of "Le Monde Social des Fourmis" in his preface to this edition is interesting because he objects to Forel's comparison of social life among ants with that among human beings. He objects to Forel's introduction of political theories, but seems to approve of the method used by the ants in dealing with "unemployables." We gather that our author objects to the views expressed by Forel more than to the subject.

F. B.—B.

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